

ELECTRICAL REVIEW

FRIDAY
5 JANUARY 1960

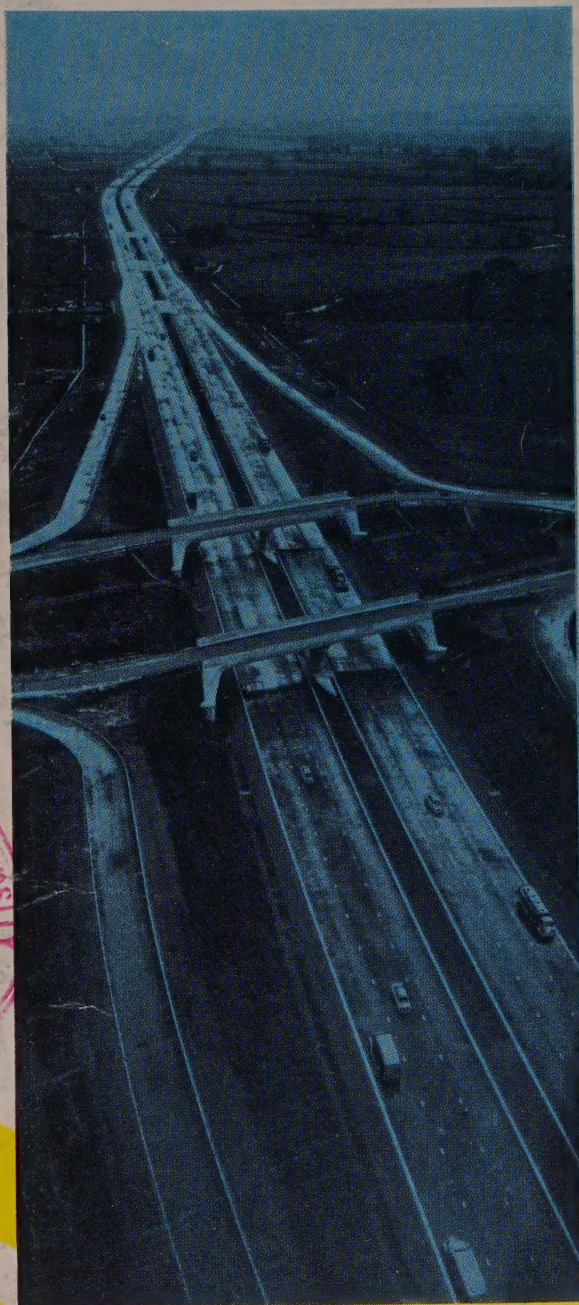
WEEKLY
PRICE 1s 6d

**FASTEST TIME
ALONG THE**

M1

is made by an emergency call from any one of the 144 phones situated along either side of the Motorway. Telcon are proud to have supplied to the General Post Office all the polythene insulated cables — some 150 miles — used in the Emergency System along the entire route of the new London to Birmingham Motorway.

TELCON CABLES



**THE TELEGRAPH CONSTRUCTION
AND MAINTENANCE CO. LTD.**

Enquiries to:
Telcon Works • Greenwich • London SE10
Greenwich 3291
Head Office:
Mercury House • Theobalds Road • London WC1
Holborn 8711



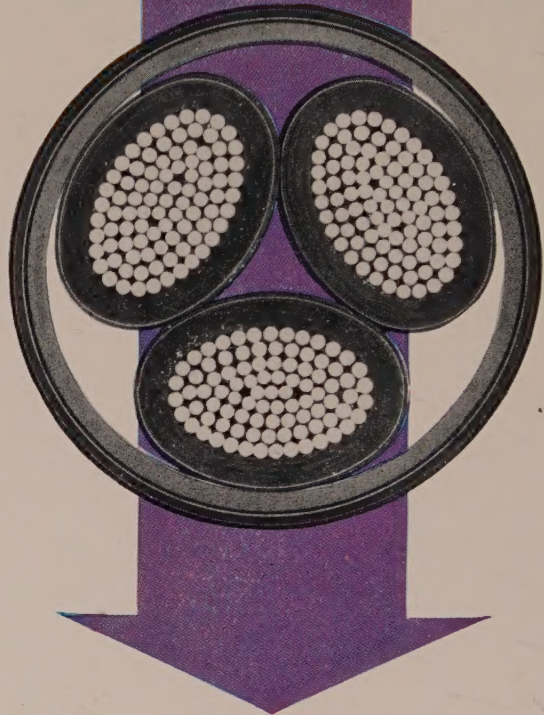
One of the actual phone boxes used.



for economy in **Oil-filled cables**

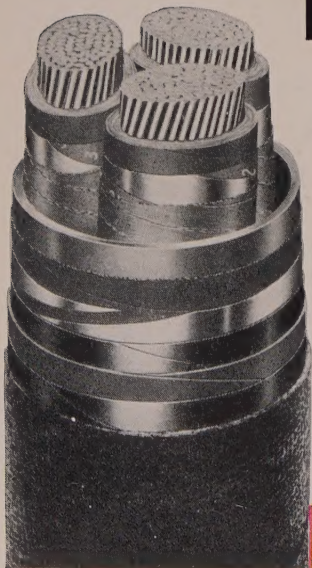
Here is BICC's latest development in 33kV power transmission — the Ductless, Shaped-Conductor, Oil-filled Cable. Dispensing with fillers and built-in ducts, this new design is essentially one of economy in materials, resulting in reduced cable costs. A full range of joints and terminations has been specially designed by BICC for use with this cable.

D.S.O. Cables can be supplied with aluminium sheaths or reinforced lead sheaths and copper or aluminium conductors. Frequently the all-aluminium D.S.O. Cable (aluminium conductors and aluminium sheath) offers the most economical design.


BICC
DUCTLESS SHAPED-CONDUCTOR OIL-FILLED
33 kV CABLES

*Further information
on D.S.O. Cables
is contained in
Publication No. 392—
available on request.*

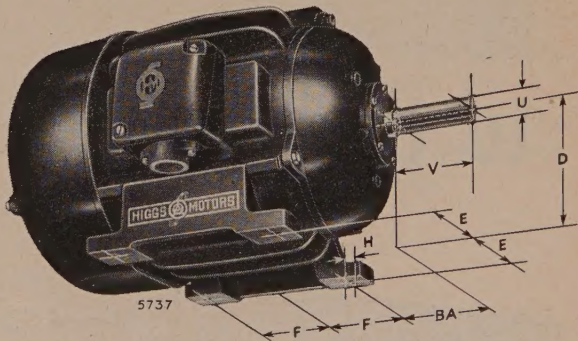
**BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET, LONDON, W.C.1**



NOW

T.E.F.C. TYPE "D" MOTORS

DIMENSIONS AS B.S. 2960
CLASS 'E' INSULATED 65°C TEMP. RISE



AVAILABILITY

NOW

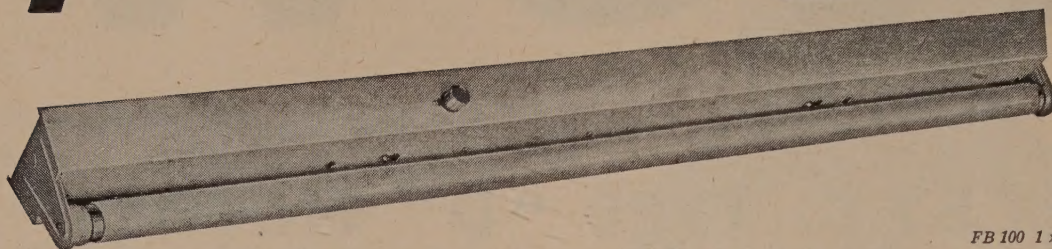
SHORTLY

Ratings h.p.				Frame Size	D	E	F	BA	H	U	V	Key	
3000	1500	1000	750									Width	Thick-ness
1 1/2	1 1/2	1 1/2	—	D162	4	3 3/8	2 1/2	2 1/2	2 1/2	1 1/2	2 1/2	3/16	3/16
2	2	2	—	D164	4	3 3/8	2 1/2	2 1/2	2 1/2	1 1/2	2 1/2	3/16	3/16
3	3	3	—	D182	4 1/2	3 3/8	2 1/2	2 1/2	7/16	1 1/2	3	5/16	1/2
5	5	5	—	D184	4 1/2	3 3/8	2 1/2	2 1/2	7/16	1 1/2	3	5/16	1/2
7 1/2	7 1/2	2 & 1 1/2	1	D213	5	4 1/8	2 1/2	3 1/2	7/16	1 1/2	3 3/8	5/16	1/2
10	10	7 1/2	2 & 1 1/2	D215	5	4 1/8	2 1/2	3 1/2	7/16	1 1/2	3 3/8	5/16	1/2
15	15	10	3	D254	6 1/2	5	4 1/8	4 1/2	9/16	1 1/2	4 1/2	7/16	5/16
20	20	15	5	D256	6 1/2	5	5	4 1/2	9/16	1 1/2	4 1/2	7/16	5/16
25	25	10	7 1/2	D284	7	5 1/2	4 1/2	4 1/2	9/16	1 1/2	5	5/16	5/16
30	30	15	10	D286	7	5 1/2	4 1/2	4 1/2	9/16	1 1/2	5	5/16	5/16
40	40	20	15	D324	8	6 1/2	5 1/2	5 1/2	1 1/16	2 1/2	6 1/2	7/16	7/16
		25	20	D326	8	6 1/2	6	5 1/2	1 1/16	2 1/2	6 1/2	7/16	7/16



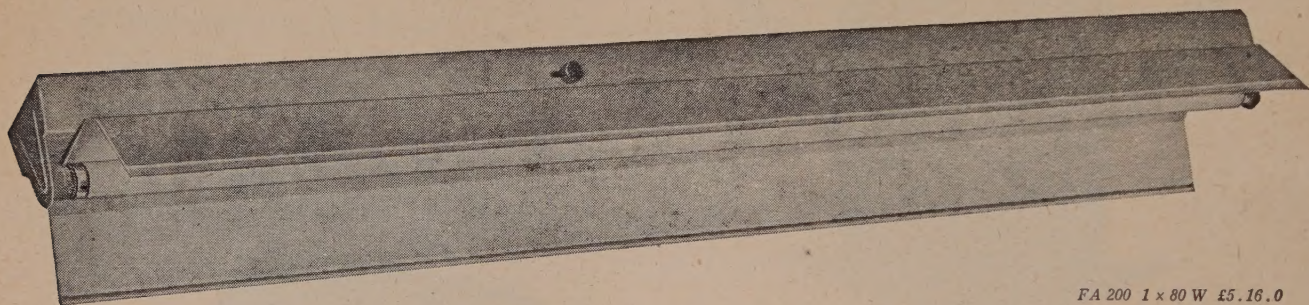
By Appointment to
Her Majesty the Queen
Manufacturers of Electric Lamps

Crompton ***Pacemaker*** fittings



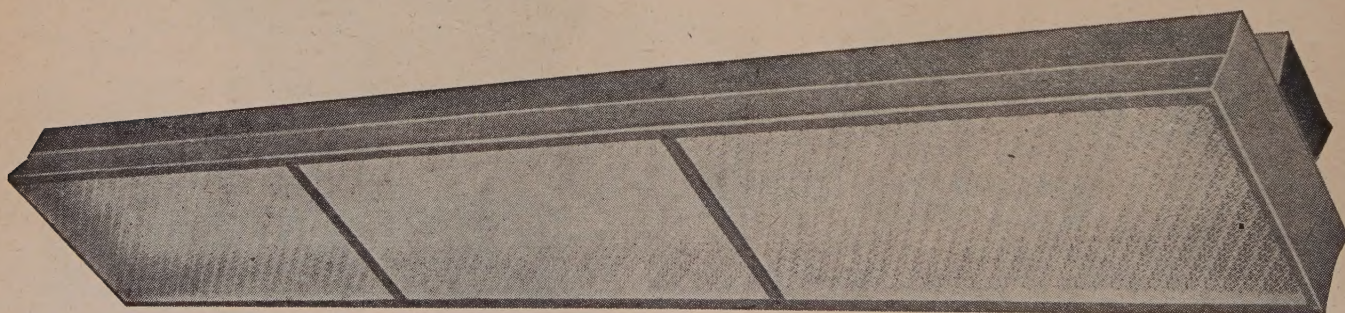
FB 100 1 x 40 W £3.16.0

owe their tremendous popularity



FA 200 1 x 80 W £5.16.0

to their price, variety and style



FA 607 2 x 80 W £10.8.8 plus P.T. 13s. 8d.

TWENTY DIFFERENT TYPES AND SIZES OF PACEMAKER FITTINGS

—from only 76s. 0d. —really set the pace in popular lighting. Order them from Wholesalers and Crompton Branches throughout the country. Write for fully illustrated price catalogue.

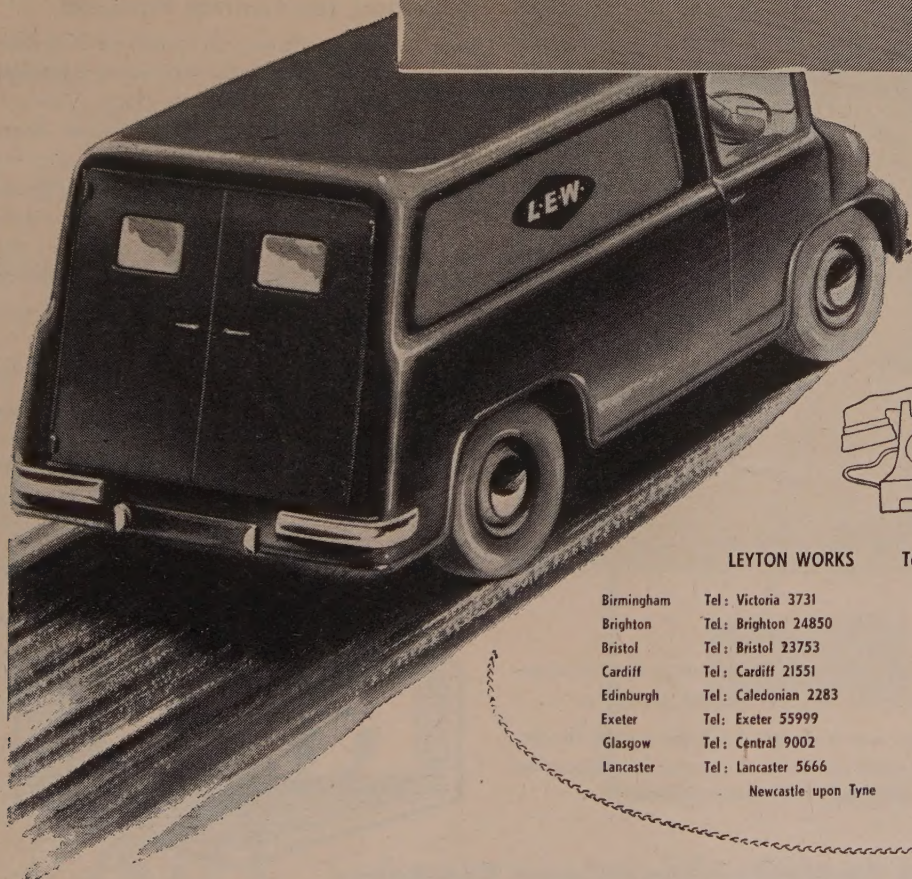


Crompton Parkinson
LIMITED

CROMPTON PARKINSON LTD. CROMPTON HOUSE, ALDWYCH, LONDON W.C.2



The Breakdown Service can help *you!*



The LEW Breakdown Service offers speedy delivery of Insulated Wires and Strips to offset the effects of breakdowns in vital or important work.

A call to our Works or the nearest Branch will bring immediate attention.



LEYTON WORKS

Tel: LEYtonstone 3636

Birmingham	Tel: Victoria 3731
Brighton	Tel: Brighton 24850
Bristol	Tel: Bristol 23753
Cardiff	Tel: Cardiff 21551
Edinburgh	Tel: Caledonian 2283
Exeter	Tel: Exeter 55999
Glasgow	Tel: Central 9002
Lancaster	Tel: Lancaster 5666
Newcastle upon Tyne	

Leeds	Tel: Leeds 637844
Leicester	Tel: Leicester 20022
Liverpool	Tel: Central 6808
London	Tel: Tate Gallery 8611
Manchester	Tel: Blackfriars 0964
Middlesbrough	Tel: Middlesbrough 2524
Nottingham	Tel: Nottingham 51650
Reading	Tel: Reading 52900
Newcastle	Tel: Newcastle 21286

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

LEYTON • LONDON • E10

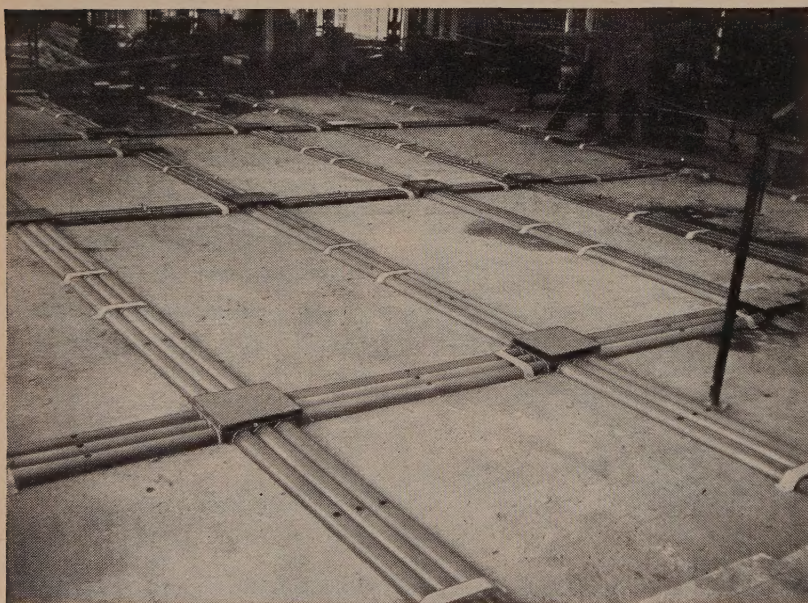


13,600 feet

of new **KEY** triple unit fibre

UNDERFLOOR DUCT

for the new **Daily Mirror** building



SOLVES ALL PRESENT AND FUTURE ELECTRICAL DISTRIBUTION PROBLEMS

Now and for the future, this immense Key Underfloor Duct installation will solve electrical distribution problems in the 'Daily Mirror' building. The system provides unique flexibility because once the duct is laid, outlets for power and telephones can be added anywhere to suit individual needs. These outlets can later be increased and extended as needs in the building change, without disturbing floors or existing wiring.

LOW COST — EASY TO INSTALL

Here closed-bottomed 'dee'-shaped duct is used, but an open-based duct is also available. Both can be economically and speedily installed. The ducts are light in weight, and easy to cut and work with normal wood-working tools. They are cheaper than any other system.

For new or existing buildings

NEW SKIRTING DUCT can be used where the installation of underfloor ducting alone would be impracticable, extending still further its convenience and flexibility.

NEW DADO DUCT is similar to skirting duct and is designed for use at desk height. These two systems and underfloor ducting itself can be used alone or in conjunction with one another in both new and existing buildings.



First and foremost in Underfloor Duct Systems



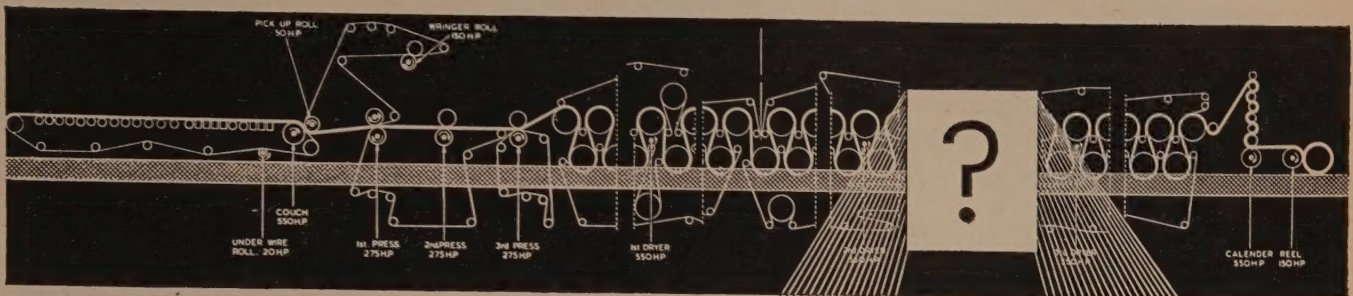
PHONE OR WRITE TO:

THE KEY ENGINEERING COMPANY LTD

BLACKFRIARS HOUSE, NEW BRIDGE STREET, E.C.4 TELEPHONE: FLEET STREET 4150

TGA UD5R

When you need more than just a motor...

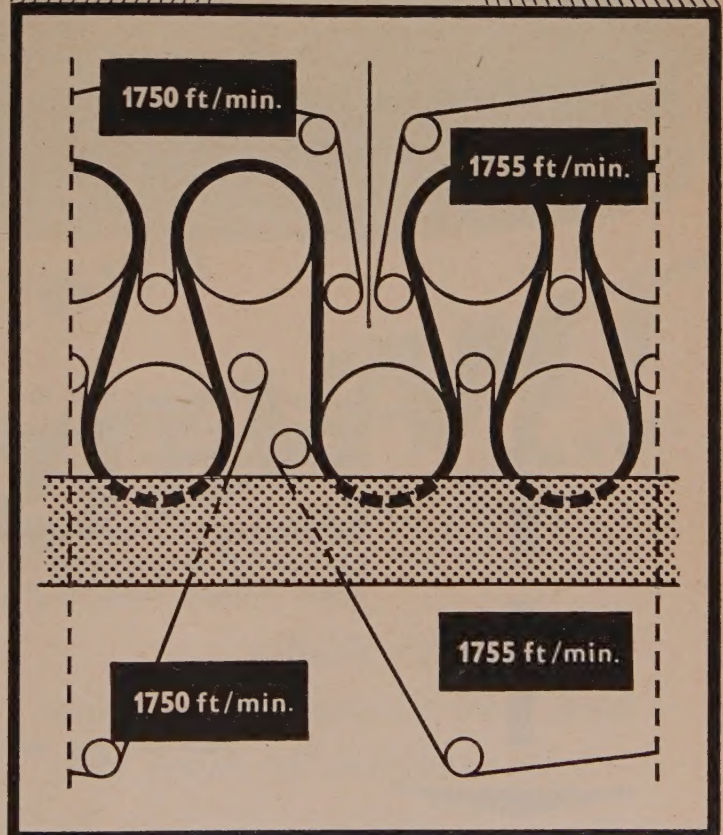


A TYPICAL PROBLEM

The importance of accurate differential speeds in sectional paper machine drives is one of the many specialised industrial problems of which AEI has extensive practical knowledge.

... call in an
AEI sales engineer

who specialises in your industry. He understands your particular problems and will ensure that you get drives and control gear designed to meet your exact needs. But his services go far beyond the supply of equipment. He will assist with every aspect of the problem, including layout, integration of related equipment, safety and operational considerations.



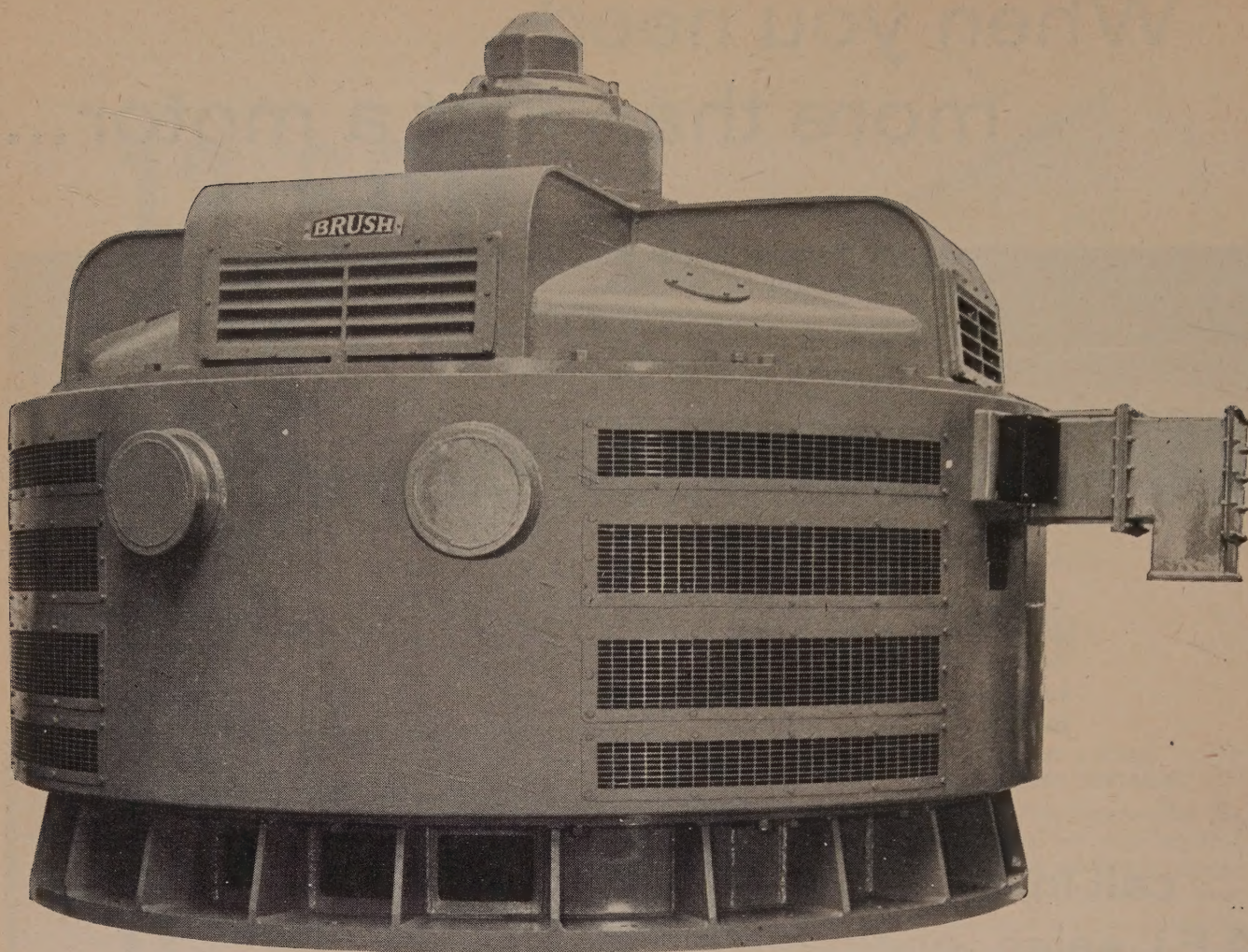
Associated Electrical Industries Limited
Motor and Control Gear Division
RUGBY & MANCHESTER, ENGLAND



INCORPORATING THE MOTOR AND CONTROL GEAR INTERESTS OF BTH AND M-V



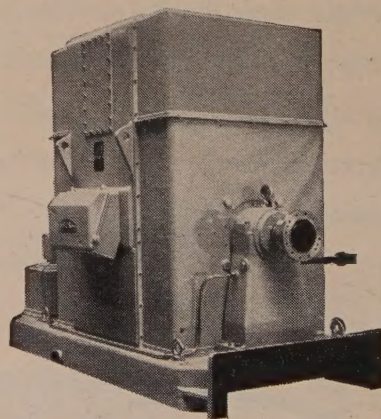
A5422



Brush motor designed for pump drive with very heavy down-thrust loading

Exhaustive endurance tests have proved the outstanding reliability of these Brush Water Pump Drive Motors.

For boiler feed and water circulating pumps, I.D. and F.D. fan and other auxiliary driving motors — specify Brush.



Boiler House feed water pump drive motor.



ROTATING MACHINES

For further details apply to:

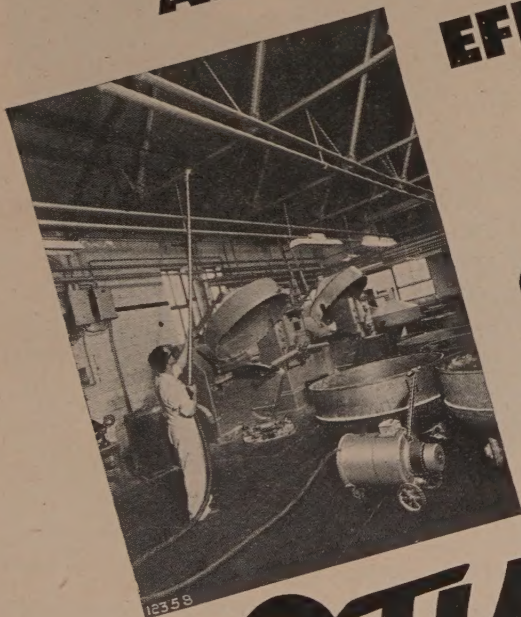
BRUSH ELECTRICAL ENGINEERING CO. LTD. • LOUGHBOROUGH • ENGLAND



(Member of the Hawker Siddeley Group)



**ALL-ROUND ECONOMY AND
EFFICIENCY**



**IS
OBTAINED
WITH**



STURTEVANT

INDUSTRIAL VACUUM CLEANERS

*which rapidly and
completely remove dust and
dirt from all surfaces and :-*

- preserve delicate machinery and equipment
- ensure high quality product finishing
- promote conditions for continuous, maximum production

Particulars of Sturtevant machines will be sent on request to our reference U/101/VC

STURTEVANT ENGINEERING CO. LTD., SOUTHERN HOUSE, CANNON STREET, LONDON, E.C.4

A Reminder of Xmas Past



The illustration shows the 1959 seasonal decorations in Regent Street, London, where 25 imposing electric chandeliers were suspended over the roadway.

Above each chandelier a REYROLLE 30-AMPERE WEATHERPROOF METALCLAD CABLE-COUPLER was used for the connection to each pendant.

This advertisement is published by kind permission of the following :

Regent Street Association, who commissioned the scheme.

London Electricity Board, West End District, who installed the fittings.

Beverley Pick Associates, who were responsible for the installation design.

Edmundsons Electrical Wholesalers Ltd., 240-250 Ferndale Road, London, S.W.9, who supplied the Reyrolle Couplers and who provide "OFF-THE-SHELF SERVICE" for Reyrolle Accessories at all their Branches and Associated Companies throughout the country.

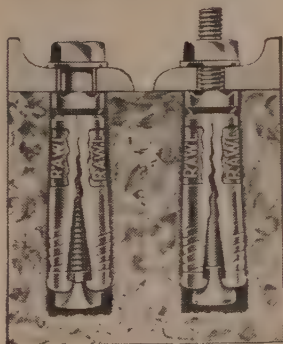
A. REYROLLE & CO
LTD
 HEBBURN • COUNTY DURHAM • ENGLAND

A **RAWLPLUG** HEAVY DUTY FIXING DEVICE

RAWLBOLTS

There is no waiting for cement to harden when you use Rawlbolts. The holes are drilled with a Rawltool to the exact size, the Rawlbolts dropped in and after the machine has been positioned the bolts are tightened. The expansion of the members locks the bolts in the holes. They cannot work loose through vibration or shock. The machine can be put into operation immediately.

Rawlbolts have earned a sterling reputation for strength and reliability throughout the world—they are used by the million every month. Rawlbolts grip by *expansion*—their strength as a fixing is based on the enormous compressive strength of concrete itself.









RAWLBOLTS ARE MADE IN TWO TYPES

For fixing heavy machinery to floors there is the Loose Bolt type of Rawlbolt which enables the machine to be slid into position after the Rawlbolt has been inserted. For wall fixings use the Bolt Projecting type which will position the fixing before tightening up.



Please write for Chart and descriptive literature.

Tools that save time For hole boring there is a big range of high efficiency Rawlplug tools for use by hand, electric and air power.

 <p>RAWLDRILLS</p> <p>For hand boring for Rawlbolt sizes A to G.</p>	<p>STAR DRILLS</p> <p>For hand boring for all Rawlbolt sizes.</p> 	 <p>DURIUM MASONRY DRILLS</p> <p>For use in hand and electric drills for Rawlbolt sizes C to G.</p>	<p>TRIFORM DRILLS</p> <p>For use in electric hammers for Rawlbolts sizes C to K.</p> 	 <p>DURIUM HAMMER DRILLS</p> <p>For use in electric hammers for Rawlbolt sizes C to J.</p>	<p>P. H. BITS</p> <p>For use in pneumatic hammers for Rawlbolt sizes E to K.</p> 
--	--	---	---	--	---

B545 A

RAWLPLUG CO. LTD., CROMWELL ROAD, LONDON, S.W.7. | THE WORLD'S LARGEST MANUFACTURERS OF FIXING DEVICES.



Bowater House, Knightsbridge. Architects: Guy Morgan and Partners. 8'x4' recessed lighting fittings over public road. Centre panel of each is close reeded 'Perspex' 3/16" thick. Surrounding panels are .040 'Perspex'. Each fitting holds two 5' 80 watt fluorescent lamps. The lay-lights are hinged for maintenance — 'Perspex' being light enough to allow this. Set of amenity Lighting Columns with .040 'Perspex' diffusers and continuous fittings with .040 'Perspex' diffusers and black 'Perspex' ends under the low block in background. All fittings by Troughton and Young (Lighting) Ltd., Knightsbridge, London.



Amenity Lighting Columns with diffuser in .040 'Perspex'. The fitting holds four 2 ft. 40 watt fluorescent lamps.



Continuous fittings between columns under low block, with diffuser in .040 'Perspex' with black 'Perspex' ends. Each 5 ft. unit accommodates one 5 ft. 80 watt lamp.

Troughton and Young (Lighting) Limited use 'Perspex' for lighting fittings at new Bowater House

Troughton and Young (Lighting) Ltd., have made exceptionally fine use of 'Perspex' acrylic sheet in the lighting fittings round the new Bowater House. 'Perspex' was chosen because it offers all these advantages :

- ★ Freedom from discolouration ★ Toughness and durability
- ★ Ease of cleaning ★ Superb appearance
- ★ Light weight ★ Resistance to atmospheric corrosion

'Perspex' can be heat shaped and is available in clear sheet and a wide range of attractive, transparent, translucent and opaque colours. Several grades of patterned 'Perspex' are available for diffusing finishes.

'PERSPEX'

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.



IMPERIAL CHEMICAL INDUSTRIES LIMITED • LONDON • S.W.1

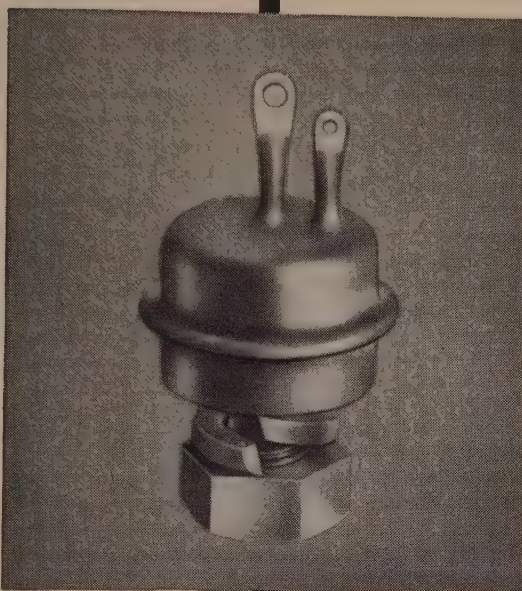
AEI

Silicon Controlled Rectifiers

NOW IN QUANTITY PRODUCTION

Some of the applications:

- ★ Motor Control
- ★ D.C.-A.C. conversion
- ★ Frequency conversion
- ★ Phase-controlled D.C. power supply
- ★ Static switching
- ★ Ignitron firing and numerous other applications in the aircraft, instrumentation and process control fields



Ratings

Rectifier Type:	Peak inverse voltage volts	Mean D.C. forward current amp.	Average Trigger power watts	Rectifier Type:	Peak inverse voltage volts	Mean D.C. forward current amp.	Average Trigger power watts
CX10/25	25	10	0.1	CX5/25	25	5	0.1
CX10/50	50	10	0.1	CX5/50	50	5	0.1
CX10/75	75	10	0.1	CX5/75	75	5	0.1
CX10/100	100	10	0.1	CX5/100	100	5	0.1
CX10/150	150	10	0.1	CX5/150	150	5	0.1
CX10/200	200	10	0.1	CX5/200	200	5	0.1
CX10/250	250	10	0.1	CX5/250	250	5	0.1
CX10/300	300	10	0.1	CX5/300	300	5	0.1

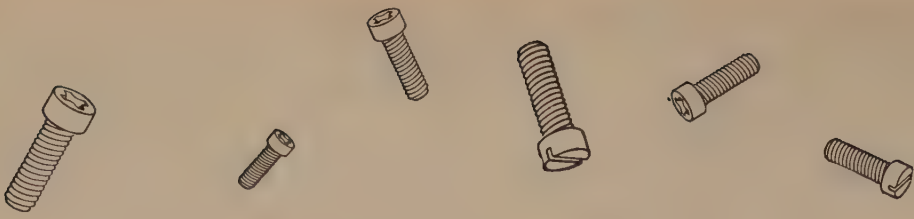
Write for full details to:



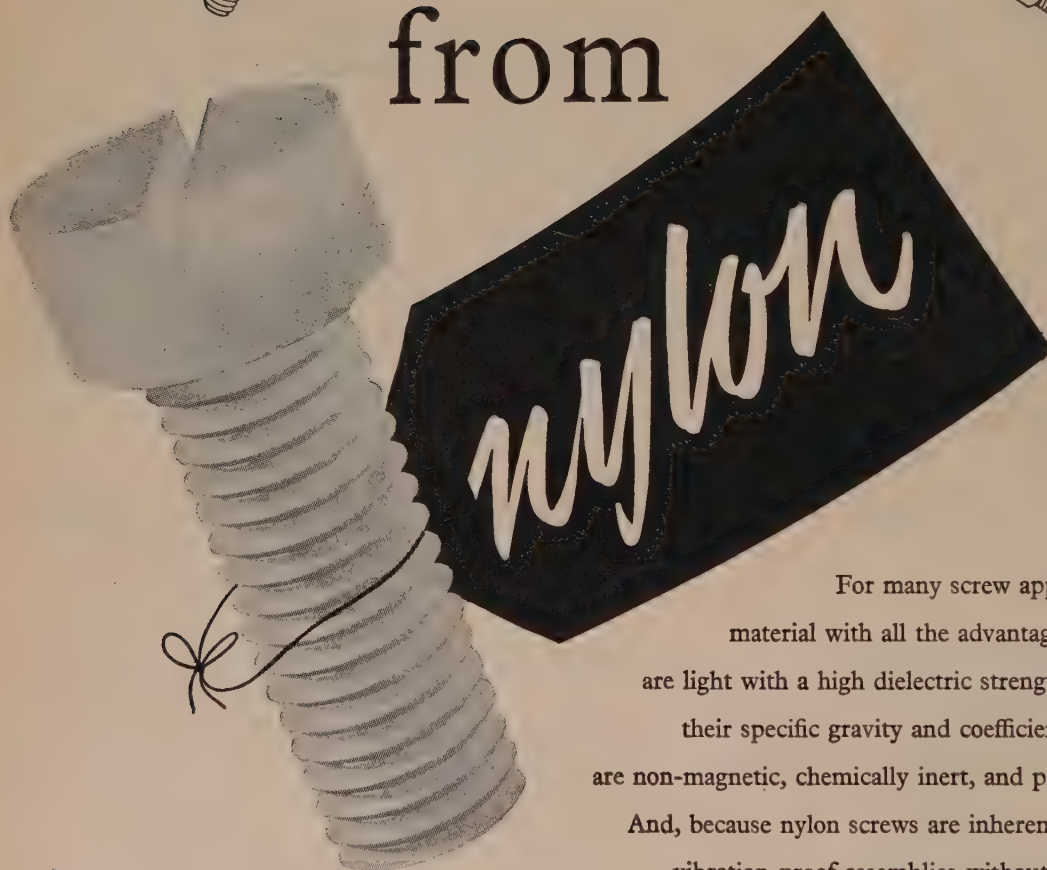
Associated Electrical Industries Limited

Electronic Apparatus Division

VALVE AND SEMICONDUCTOR SALES
LINCOLN, ENGLAND



These screws are made from



For many screw applications there is no other material with all the advantages of nylon. Nylon screws are light with a high dielectric strength and abrasion resistance; their specific gravity and coefficient of friction are low; they are non-magnetic, chemically inert, and provide excellent insulation. And, because nylon screws are inherently self-locking, they make vibration-proof assemblies without any need for lockwashers.

Full technical information freely available on request.

made specially for scientists by

GKN

GUEST KEEN & NETTLEFOLDS (MIDLANDS) LIMITED

Box 24, Heath Street, Birmingham 18 Telephone Smethwick 1441 Telex 33-239

S/N/3052

WHATEVER YOUR BUSINESS . . .

PHILIPS PUT IT IN A BETTER LIGHT



General Office, Bowater Corrugated Cardboard Works, Ellesmere Port.



Planned light is more attractive, easier on the eyes, and far superior for any form of displays. And there's an added advantage offered by a lighting plan from Philips . . . it's free!

Philips Lighting Design Service provides you with individual advice on the exact lighting for any purpose. It puts at your disposal a team of expert lighting engineers and a fully-qualified architect — all without charge or obligation. Set the wheels in motion now: post the attached coupon to Philips.

**PHILIPS FREE
LIGHTING DESIGN
SERVICE**



Please send me full details of your
FREE LIGHTING DESIGN SERVICE
Philips Electrical Ltd., Lighting Division,
Century House, Shaftesbury Avenue, London, W.C.2

NAME.....
ADDRESS

ER 9

(LD3251)

Shell Voluta Oil 45 revolutionises



heat exchange practice

Before Shell produced Voluta Oil 45 it was thought that oils which were to be used for heat exchange purposes must have a high flashpoint—to reduce fire risk, and a high viscosity—to prevent excessive leakage through pump glands and to provide adequate lubrication for pump bearings at high temperatures. Heat exchange systems containing these viscous oils, however, were sluggish, particularly when started up from cold. The oil circulated slowly over the source of heat and suffered thermal decomposition, or "cracking". This, in turn, produced low flashpoint materials and carbon which insulated the heating surface.

Shell, therefore, began investigating the suitability of oils of lower viscosity and different chemical constitution. From this research was developed Shell Voluta 45.

Shell Voluta 45 contains hydrocarbons with a

saturated ring structure which does not have the tendency that high viscosity straight chain paraffin hydrocarbons had—to break down at high temperatures. Because of its low viscosity Shell Voluta 45 heats up more quickly from cold and circulates more rapidly thus avoiding local overheating and thermal decomposition.

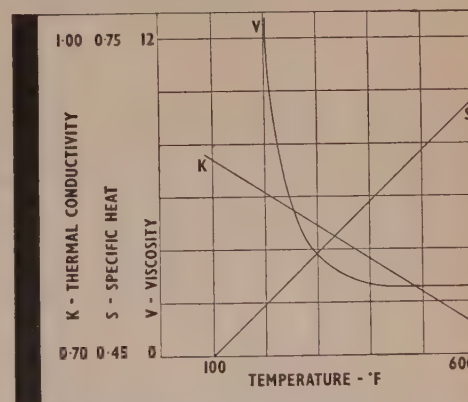
Shell Voluta Oil 45 has excellent heat transfer properties, good thermal stability and good lubricating properties. It is recommended for use in all closed heat transfer systems.

The moral of the story is that Shell research is supremely applicational. The centre at Thornton is always ready to work with even the most specialised sectors of industry to produce the right oil for the job. If you and your organisation have any major lubricating problems, it pays to get in touch with your local supplier of Shell Industrial Lubricants.

The Research Story

Laboratory research to compare the high temperature performance of various oils in a rig simulating practical conditions showed that when oils of varying viscosities were maintained at an average temperature of 325°C. for 200 hours, the closed flashpoint of the high viscosity oils had dropped to a lower figure than that of oils of lower viscosity, indicating that some thermal decomposition had taken place.

Experimental oils were subjected to Heat Stability Tests and to tests designed to measure the variation in heat transfer coefficient with time. The most promising of these oils was then given extensive field trials, both in Shell Installations and in industry. From this extensive research was developed Shell Voluta 45.



Physical properties of Shell Voluta Oil 45.

K. Thermal Conductivity—B.T.U./sq. ft. per hour per 1°F. per inch.

S. Specific Heat—B.T.U. per lb. per 1°F.

V. Viscosity—Kinematic centistokes.



HEAT TRANSFER OILS

another proof of Shell leadership in lubrication

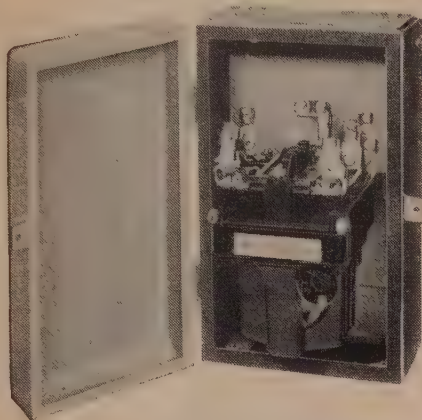
BKS

CONTACTORS

for

HEATING CONTROL

or similar non-inductive loads



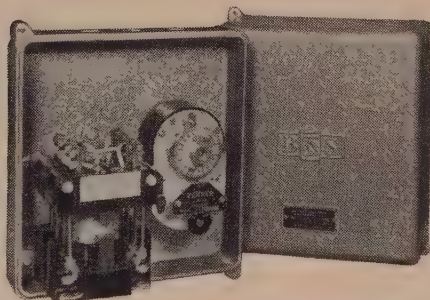
Type D10 60 in steel housing.

★ Comprehensive range of contactors for all types of thermal storage and space heating control.

★ FOR SILENT OPERATION. All models can be fitted with D.C. operating coil and rectifier.

10 AMP TO 350 AMP

single,
double,
triple
or
four
pole



Triple pole 30 amp. Contactor with Time Switch type MD1SP

BRITISH KLOCKNER SWITCHGEAR LTD.

Head Office and Works: **CHERTSEY, SURREY**

Telephone: Chertsey 3467

Telegrams: Switchgear, Chertsey

SALES OFFICES

- LONDON:** Refer to Head Office.
- MANCHESTER:** Cromford House, Cromford Court, Manchester 4.
Tel.: BLackfriars 3903
- GLASGOW:** 73 Robertson Street, Glasgow, C.2.
Tel.: CENTral 2479
- NEWCASTLE:** Mr. H. Breeze, 4 Beechwood Avenue,
Monkseaton, Whitley Bay, Northumberland.
Tel.: Whitley Bay 24231
- BIRMINGHAM:** 2-3 Graham Street, Birmingham 1
Tel.: CENTral 6693
- DUBLIN:** Mr. H. E. Kilbride-Jones, 11 Crow Street,
Dublin. Tel.: Dublin 71717

post this coupon **TO-DAY**

To **BRITISH KLOCKNER SWITCHGEAR LTD. CHERTSEY, SURREY**

Please send me your latest comprehensive catalogue

NAME _____

POSITION _____

FIRM _____

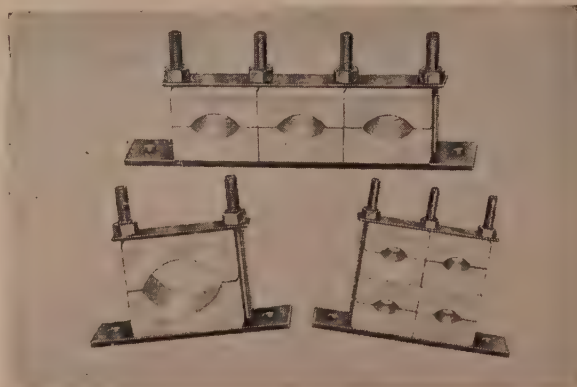
ADDRESS _____

ER/15/1/60

POWER CABLE RACKS

HIGHER QUALITY

LOWER PRICES



with PORCELAIN or HARDWOOD CLEATS
also

CABLE HANGERS SUSPENDING HOOKS

Galvanized, Bitumen or other finish

CABLE SADDLES, SPECIALS and FABRICATED STEELWORK

Lists on Request

W. W. B. DAVIES
Engineer

Lionell Works, Arthur Road, Hay Mills
Birmingham 25 Phone: VIC. 3103

for

Electrical Insulation

of every type

The largest and most comprehensive range of insulating materials in the country. Supplied in sheet, rod and tube form.

For any type of electrical insulating material we can usually give ex stock or early delivery. We can offer strip and coil form material cut accurately to size for stamped components. Most grades of insulating material can be offered in this form with quick delivery and competitive prices. Also fabricated parts can be manufactured to suit individual requirements.

Please write or 'phone if further details or samples are required.

Also
Turned and
Pressed
Parts

HEAVEN DOWSETT & Co Ltd.

INSULATION HOUSE, 315 WELLINGTON ROAD
BIRMINGHAM 20
Phone: BIRchfield 6218-9 Grams: Fibre B'ham 20

VULCANISED FIBRE

LEATHEROID

EBONITE

BAKELITE
(Fabric & Paper Base)

Hot - but not bothered

1700°C

KANTHAL *SUPER*

You can make it very hot for
Kanthal Super elements — as hot as
1700°C in fact. Only *Kanthal Super* achieves
this very high temperature with constant
resistance, maximum efficiency and
economy in running costs.



For further information about KANTHAL SUPER write to:

HALL & PICKLES LTD

PORT STREET • MANCHESTER 1

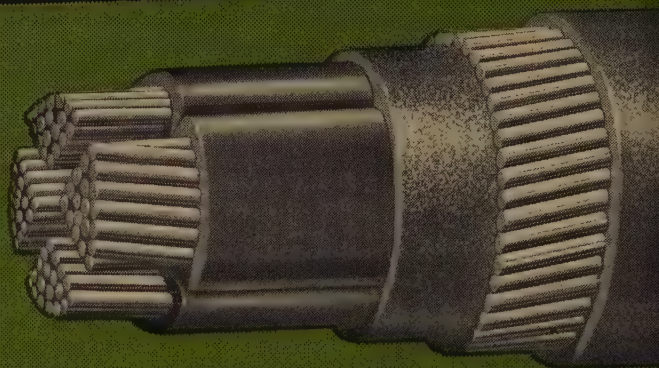
SOLE AGENTS FOR KANTHAL PRODUCTS IN
GREAT BRITAIN AND NORTHERN IRELAND

60 YEARS OF PROGRESS...

P.V.C. INSULATED POWER CABLES

Available for the same conductor range as for Paper Insulated Cables, to B.S. 480/1954, for voltages up to and including 3.3 Kv.

Send for publication No. B16



CONNOLLYS

PAPER INSULATED POWER CABLES

Standard range covers 1,100 volts to 11,000 volts with full range of armouring and overall protection with bituminous textiles or P.V.C.

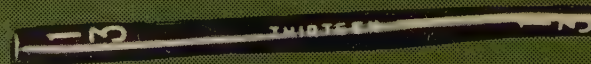
Further details on request.



PILOT AND CONTROL CABLES

A range of power and control cables is available at voltages up to 1,100. To facilitate identification, the P.V.C. insulated cores are clearly printed at frequent intervals with the appropriate legend and numerals. The laid up cores are sheathed with P.V.C. and can be armoured and P.V.C. protected if required.

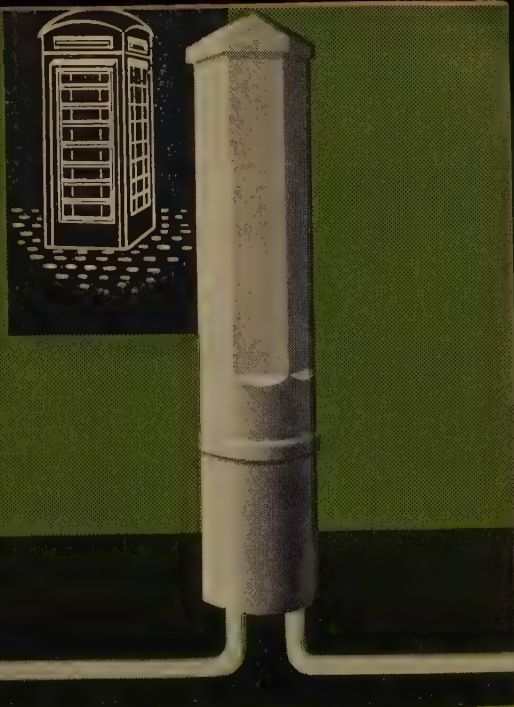
Further details on request.



TELECOMMUNICATION CABLES

Connollys plastic insulated and sheathed cables are servicing telephone administrations throughout the world. Cables can be armoured with protected galvanised steel if there is a danger of mechanical damage, or they can be supplied with inbuilt catenary for overhead suspension. All cables are suitable for installation in tropical conditions.

*Send for publication B.11A (Polythene Insulated)
and publication B.14A (P.V.C. Insulated)*



FOR CABLES

WIRING SYSTEM CABLES

Connollys stock a wide range of plastic insulated and sheathed cables in accordance with B.S. 1557/1954 (Polythene insulated, P.V.C. sheathed) and B.S. 2004/1955 (P.V.C. insulated, P.V.C. sheathed).

Further details on request.



'BLACKLEY' INSULATING TAPE

'Blackley' Tape has been produced by Connollys since 1895 and its adhesive and insulating properties are appreciated throughout industry. The adhesive surfaces never 'strip' because the rubber compound is frictioned on to both sides of specially woven cloth. Available in widths $\frac{1}{2}$ " to 2" in 5, 10, 25 and 50 yard rolls.

Send for publication No. B.12.

CABLE DIVISION

CONNOLLYS (BLACKLEY) LIMITED

HEAD OFFICE AND WORKS MANCHESTER 9



HOME BRANCH OFFICES AND STORES

LONDON: 23 Starcross St. N.W.1. Tel: Euston 6122

BIRMINGHAM: 39-44 Watery Lane, Bordesley 9
Tel: Victoria 4991-2. Telex: 33-309

GLASGOW: 73 Robertson St. G.2. Tel: Central 3662

NEWCASTLE-UPON-TYNE, 1: 6 Baltic Chambers, Quayside
Tel: Ponteland 3128

LEIGHTON BUZZARD: Viney Drive. Tel: 3470

Tel: CHEETHAM HILL 1801 Grams: CONNOLLYS BLACKLEY



Metrosil non-linear resistors provide a reliable means of safeguarding all types of electrical equipment against surge voltages. A rise in voltage to twice the normal value increases the current approximately twenty times. Based on silicon carbide, Metrosil is usually made in the form of discs, but rods are also produced for certain applications. These standard products are stable and convenient in size, standard discs ranging from $\frac{3}{8}$ " to 6" in diameter. Typical applications for Metrosil products include the protection of field coils, relay coils and solenoids, instrument relays, condensers, tap-changing switches and power transmission lines. Other applications include spark quenching, protection of instruments under fault conditions, relay sensitivity improvement, etc. *Please write for descriptive leaflet No. 220/1-1.*

Associated Electrical Industries Limited

INSTRUMENTATION DIVISION - SCIENTIFIC APPARATUS & X-RAY DEPT.

Trafford Park, Manchester 17

A New Circuit Component

WOOTTON

METER BOARDS

Use *proves* their superiority—made from carefully tested material, and ready to stand up to weather hazards anywhere, WOOTTON Meter Boards are the *best*—and that's the bear truth.

... and don't forget WOOTTON wood blocks, sunk switch boxes and instrument cases.

**Bear
it in
mind**

**are
the
best!**



WOOTTON & CO. LTD., ALMA WORKS, PONDERS END, MIDDX.

Telephone: HOWard 1858

Introducing the CORNISH RANGE OF REDCLIFFE TRANSFORMERS



REDCLIFFE
INDUSTRIES (BRISTOL) LIMITED

**a new transformer
leaflet—you should
have a copy**

This new range has been designed to meet the increasing demand for a robust, smaller and more efficient transformer. It has been made possible by the use of modern grain oriented laminations which not only bring about a saving in size and weight of the finished unit, but, equally important, a substantial saving in cost.

Sealed 'C' Core Transformers

We proudly announce that Interservices Type Approval Certificate No. 1293, issue 1, has been granted in respect of the above.

Write now for the new leaflet No. T.1 just published, which gives full details of the CORNISH RANGE.

REDCLIFFE INDUSTRIES (BRISTOL) LIMITED

Emery Road, Brislington, Bristol 4. Bristol 77431

SOLE SELLING AGENTS:

Oliver Pell Control Limited

Cambridge Row, Burrage Road, Woolwich, London S.E.18. Woolwich 1422

specify *Sheen* cable jointing equipment



This meets all the requirements of Local Authorities and Main Contractors. Of sound design and robust construction — it is manufactured by a Firm with many years experience in this type of equipment. *We recommend Propane as supplied by Shell-Mex and B.P. Gases Limited for use with all our equipment.*

For details apply to
**SHELL-MEX AND
B.P. GASES LIMITED**

Cecil Chambers 76-86 Strand WC2.

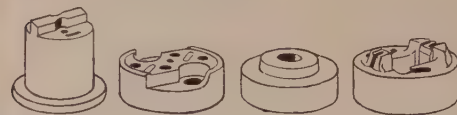
SHEEN (NOTTINGHAM) LTD.
Greasley Street, Bulwell, Nottingham
Telephone 27-1437

Registered design pending



Porcelain Insulators

INSULATORS FOR
HIGH TENSION,
LOW TENSION,
REFRACTORIES
AND SPECIAL CERAMICS



JAMES MACINTYRE & CO. LTD.

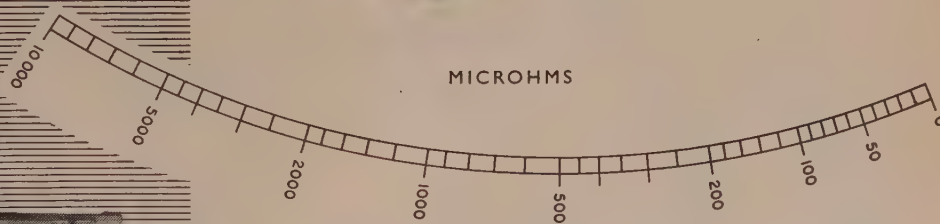
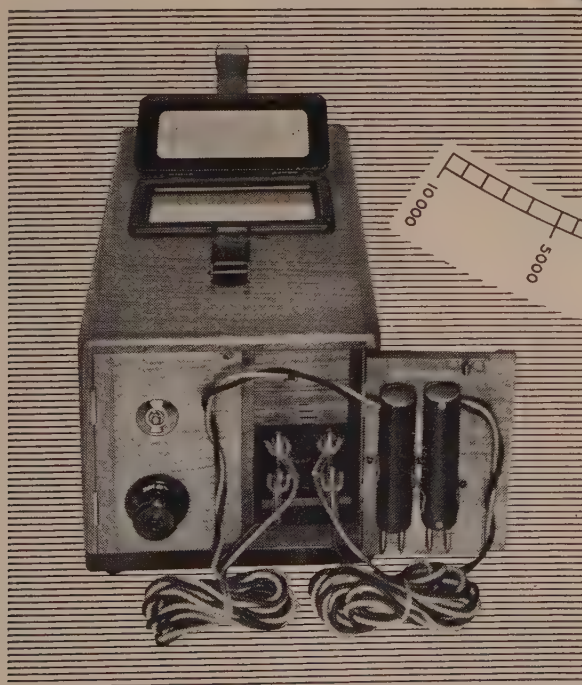
WATERLOO ROAD, BURSLEM
PHONE: STOKE-ON-TRENT 87938



Mains operated instrument.
A similar battery operated instrument also available.

Compartment for leads and testing spikes.

In the battery model, this compartment contains 2 alkaline cells.



An entirely new, self-contained, direct reading testing instrument having a range of measurement from :

10 microhms to 1 ohm

provided by a 2-position switch (x 1, x 100).

Size 16½ x 8½ x 8½ ins. Weight 26½ lb.

Write for Publication EJ051/16/17

EVERSHED

INSTRUMENTS DIVISION **EVERSHED & VIGNOLES LTD.** • LONDON • W.4
Telephone: Chiswick 3670 • Telegrams & Cables: Megger, London Telex 22583
7/119B



NEW Electrolux 65

All everyday cleaning with only two tools

Here's something completely new in home cleaning that every housewife will want to buy. With just two dual purpose tools this new Electrolux 65 does *all* the everyday cleaning. Electrolux, first

with new developments through the years are first again with this brilliant new idea. An outstanding advance which makes home cleaning easier, quicker and more efficient than ever before!

Electrolux *excels*

Electrolux *excels*

ELECTROLUX LIMITED, 153/5 REGENT STREET, LONDON, W.1

NEW Electrolux 65

The cleaner everyone's going to want!

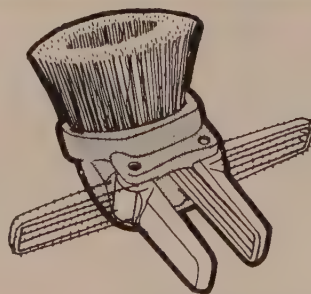
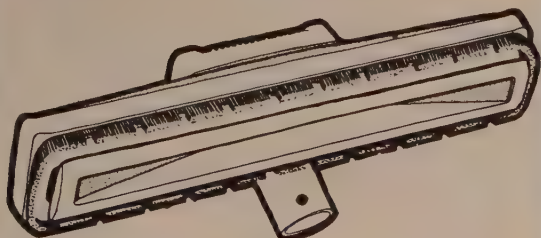
Here it is—the most advanced home cleaner ever made. From the superb design to the simple-to-adjust telescopic tube this cleaner combines every new idea, every helpful new feature that can bring housewives easier, quicker and more efficient home cleaning.

- Deep reaching suction power
- Whisper quiet motor
- New telescopic tube
- Hygienic 'throw-away' dustbags
- New easy carry handle with wind-round flex storage
- New washable, plastic covered hose with snap action coupling
- Special crevice nozzle for cleaning out-of-the-way places
- Sprayer for carpet shampoos, paint, distemper etc.
- Unique air purifying pad
- Moves easily on nylon rollers
- Spring loop to hang cleaner ready for instant use
- Cash price £29.11.5

ALL EVERYDAY CLEANING WITH ONLY TWO TOOLS

Carpet nozzle and floor brush in one Here's the carpet nozzle—but a press of the toe and—presto—it's the brush for hard floors. And it's just as simple to turn it into the carpet nozzle again! Electrolux does all the floor cleaning with one tool.

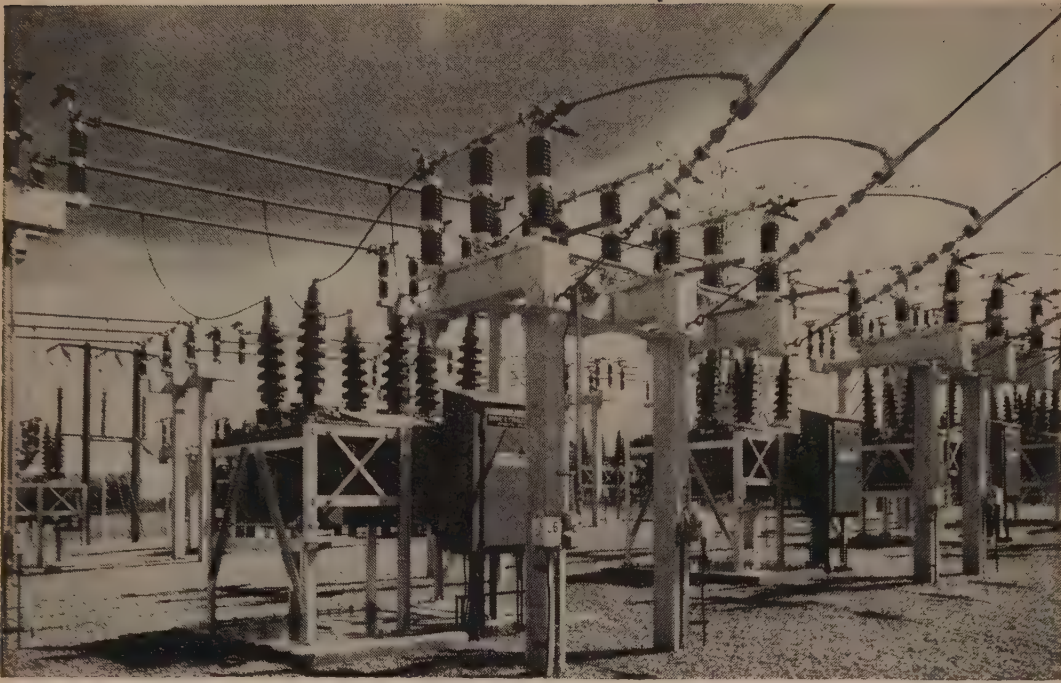
Dusting brush or cleaning nozzle at a touch Here's the dusting brush. But turn it round, open the wings and there's the nozzle for cleaning your upholstery, stair-carpets, curtains—and the TELESCOPIC EXTENSION TUBE brings everything within easy reach.



Electrolux *excels*

Electrolux *excels*

ELECTROLUX LIMITED, 153/5 REGENT STREET, LONDON, W.1



**For outdoor
or indoor switchgear
up to and including 66kV**



COOKE & FERGUSON LTD.,

IN ASSOCIATION WITH

CROMPTON PARKINSON LIMITED



CROMPTON HOUSE • ALDWYCH • LONDON W.C.2

ENALON PLASTICS LIMITED

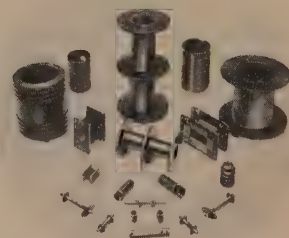
Phone: TONBRIDGE 3343/4/5

DRAYTON ROAD · TONBRIDGE · KENT

Grams: 'ENALSCO'

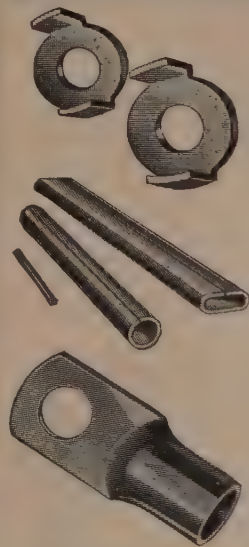
Specialist Manufacturers of Plastic Materials to the
Electrical, Radio and Television Industries . . .

- ENALON PRECISION WOUND COIL FORMERS
- ENALON MACHINED INSULATION COMPONENTS
- ENALON S.R.B.P. TUBING
- ENALON STAMPINGS and COMPONENTS



Are Pressings your Problem?

If the answer is 'yes' let us solve your problems for you. We manufacture precision presswork to any specification required, efficiently and with prompt attention. Every order is handled with the same interest and care that has built our reputation as master craftsmen. This reputation is your assurance of complete satisfaction. We invite your enquiries. The items illustrated are a few from our range of pressings for the Electrical Industry.



HAMPTON WORKS

(STAMPINGS) LIMITED

TWYNING ROAD · STIRCHLEY · BIRMINGHAM 30

Tel: KINGS Norton 2901

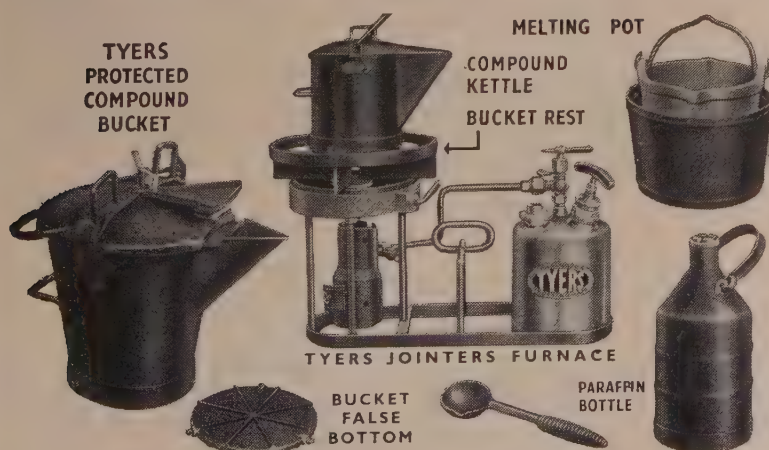
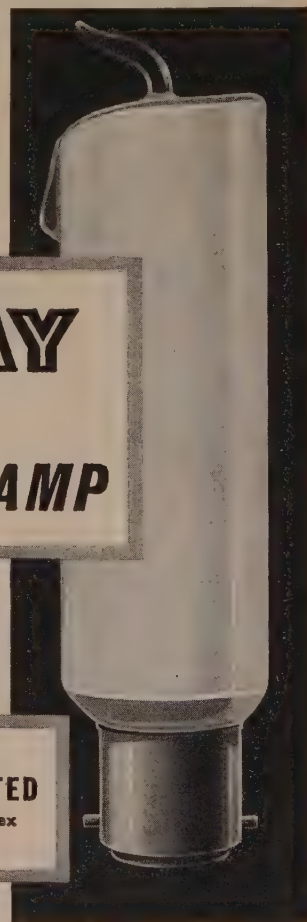
Grams: RADIAGILLS BIRMINGHAM

ISMAY ART CANDLE LAMP

In 25W. and 40W. White
Opal or colour sprayed
champagne, red or green.
Standard Caps. B.C. and
S.B.C.

All enquiries to:
ISMAY LAMPS LIMITED

Roden Street Works, Ilford, Essex
Telephone: ILFORD 1153

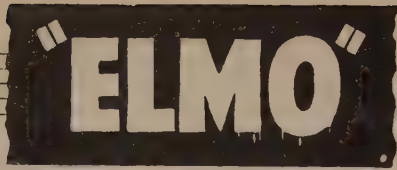


TYERS JOINTERS EQUIPMENT

For Dependability

The only choice in 1885...
Still the BEST today!

PORTABLE FURNACE AND PATENTS CO.
CARRINGTON · NOTTINGHAM
Telephone 64887 Telegrams 'FURNACE NOTTINGHAM'



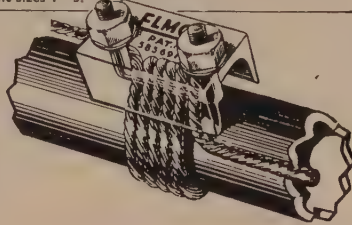
EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948
IN 4 SIZES

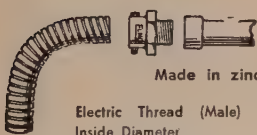
	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	$\frac{1}{2}$ " to $\frac{3}{4}$ "	1" and $1\frac{1}{4}$ "	$1\frac{1}{2}$ " and 2"	$2\frac{1}{4}$ " to $3\frac{1}{4}$ "

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.

"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.



ELECTRICAL FITTINGS



Flexible-to-rigid CONDUIT COUPLINGS

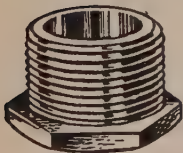
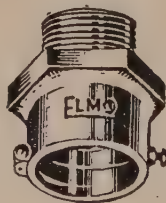
Made in zinc base alloy in the following sizes:

Electric Thread (Male) $\frac{5}{8}$ " $\frac{3}{4}$ " 1" $1\frac{1}{4}$ " $1\frac{1}{2}$ " 2"
Inside Diameter $\frac{5}{8}$ " $\frac{3}{4}$ " 1" $1\frac{1}{4}$ " $1\frac{1}{2}$ " 2"

Electric Thread (Male) $\frac{5}{8}$ " $\frac{3}{4}$ " 1" $1\frac{1}{4}$ "
Inside Diameter Flexible Conduit $\frac{1}{2}$ " $\frac{5}{8}$ " $\frac{3}{4}$ " 1"

WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



MALE
Hex. Section

CONDUIT BUSHES

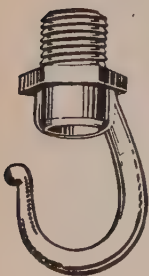
Made in the following sizes:

MALE: Electric Thread $\frac{5}{8}$ " $\frac{3}{4}$ " 1" $1\frac{1}{4}$ " $1\frac{1}{2}$ " 2"

FEMALE: Electric Thread $\frac{5}{8}$ " $\frac{3}{4}$ " 1" $1\frac{1}{4}$ " $1\frac{1}{2}$ " 2"



FEMALE
Flat Face Section for
Spanner (except $\frac{3}{4}$ "
size, which is round)



CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed $\frac{3}{8}$ " thread, male electric.

Made to fit all standard boxes with two holes $7/32$ " diameter — 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

Both made in aluminium alloy

CEILING PLATE

One hook



Manufactured by **M. MOLE & SON LTD.**
BIRMINGHAM · 3 · ENGLAND Est. 1835

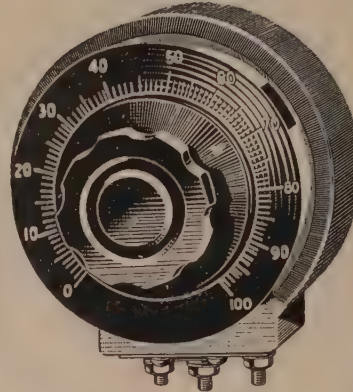
Consult

Birch

REGISTERED TRADE MARK

for

TOROIDAL RESISTORS



FORMER: Patented ceramic moulding with horizontally opposed copper graphite internal brush movement.

WINDING: Best quality resistance wires to B.S.S. 115.

Write for list No. 130

VITREOUS ENAMELLED RESISTORS

Ferrule or wire end type: full range of 24 sizes — $1\frac{1}{2}$ — 250 watts. List VE 190.

also makers of:
Asbestos Woven Mats
Heating Elements
Loading Resistors
Motor Operated Resistors
Stud Type Resistors
Sliding Resistors



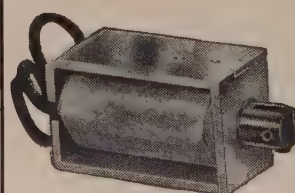
H. A. BIRCH & CO. LTD.

WOOD STREET, WILLENHALL, STAFFORDSHIRE

Telephone: WILLENHALL 494 · 495 · Grams: WILOHM WILLENHALL
LONDON OFFICE: HERGA WORKS, WALLINGFORD ROAD, UXBRIDGE
MIDDLESEX. Tel.: Uxbridge 5211



Consult SOUPLEX Limited
WESTGATE · MORECAMBE PHONE 1717/8



QUICK DELIVERY

Solenoids are normally despatched same day as receipt of order

PHIL-TROL SOLENOIDS

New 6-page Leaflet (No. 108) now available. Covers small and medium solid core types including new types 45, 35, 36 and 37.

Send for your copy now.

PHILLIPS CONTROL (G.B.), LTD.

Dept. G21, Farnborough, HANTS Telephone: Farnborough 1120

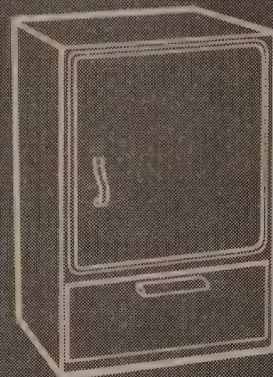
BROOK do not make



WASHING MACHINES

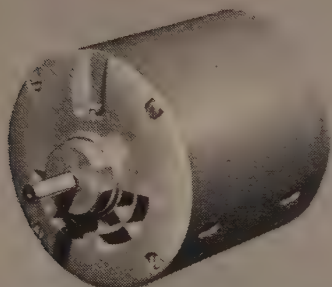


GEAR UNITS

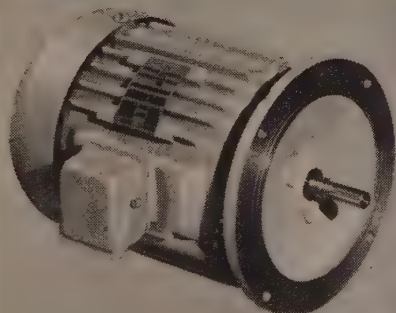


REFRIGERATORS

but they do make...



**'MERLIN' WASHING
MACHINE MOTORS**



**MOTORS FOR FITTING
TO GEAR UNITS**



**STATOR/ROTOR UNITS
FOR REFRIGERATORS**

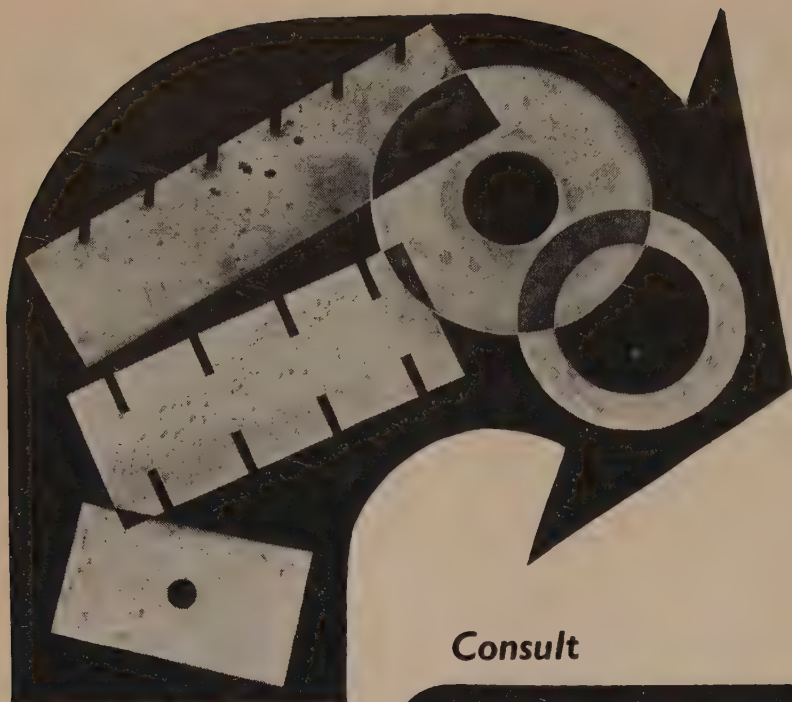
MOTORS FOR ALL THESE AND MANY OTHER SPECIAL PURPOSES

If you export your product, remember **BROOK** service is available all over the world... there are few countries where they are not known and used

BROOK

HUDDERSFIELD

the first name you think of... for electric motors
from 1/25th. to 600 h.p.



for
MICA
INSULATION

Consult

EAST LONDON MICA WORKS

RINGWOOD RD., WALTHAMSTOW, LONDON, E.17

ESTD. 1912

Phone:
COppermill 2248/9

Telegrams:
Elmicmer, Easphone, London

1908 — 52 YEARS — 1960

OF RELIABLE SERVICE IN THE DISTRIBUTION

of

EVERY DESCRIPTION

of

ELECTRICAL MATERIAL

for

EVERY SITUATION

We Handle High-Class Material Only

Our Addresses:

Liverpool:
 1-17 Stanley Street

Manchester:
 72 Chapeltown Street

Carlisle:
 Paternoster
 Row

Birkenhead:
 94 Chester Street

Workington:
 Oxford Buildings
 Oxford Street

Telephone: Central 5491
 (10 lines)

Telephone: Ardwick 5292
 (4 lines)

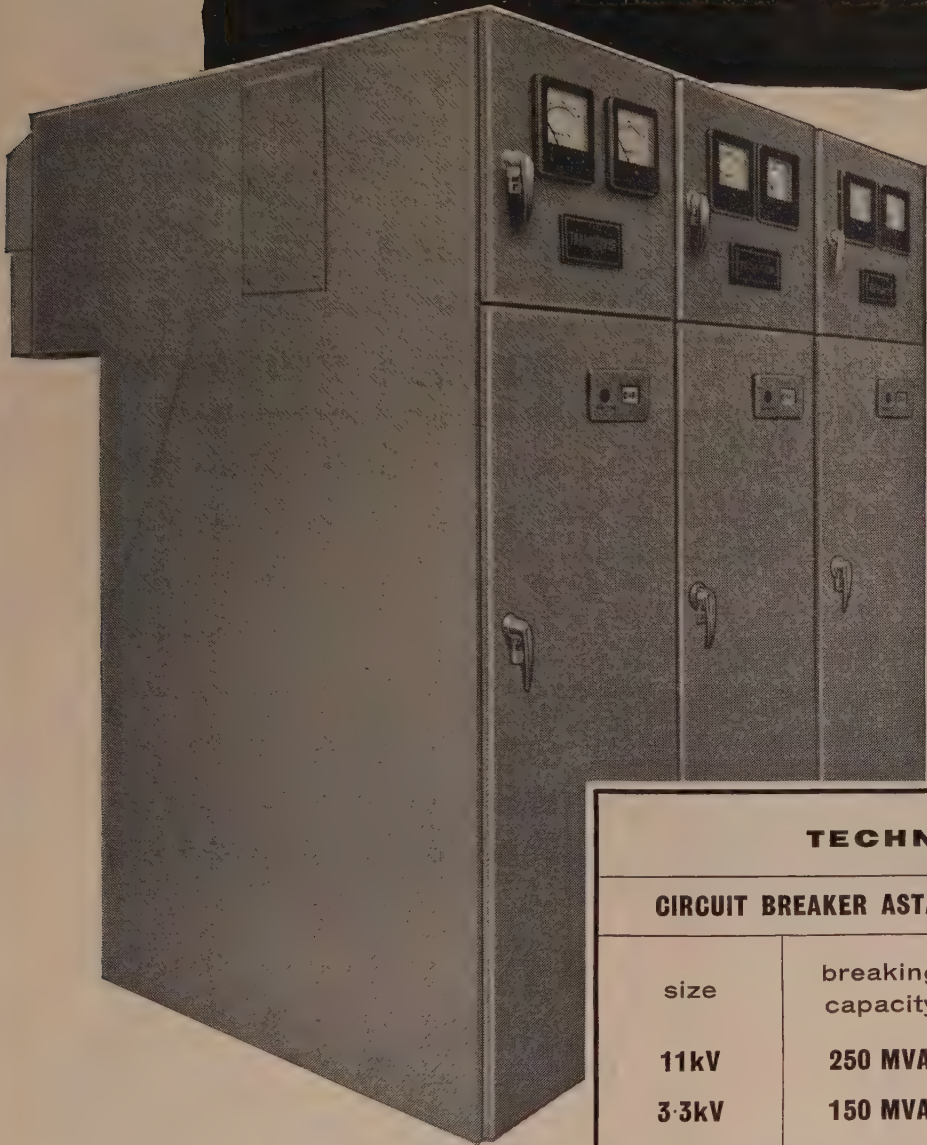
Telephone: 26231-2

Telephone: 4340-1

Telephone: 139

DOWNES & DAVIES LTD.

THE NEW ELLISON HIGH TENSION SWITCHGEAR



DIMENSIONS

The overall dimensions of a basic circuit breaker unit have been reduced to the minimum permissible for easy accessibility.

They are as follows:—

24" wide, 6' 4 $\frac{3}{4}$ " high and 4' 9 $\frac{5}{8}$ " back to front.

A voltage transformer adds

1' 5 $\frac{9}{16}$ " to the height.

TECHNICAL DATA

CIRCUIT BREAKER ASTA CERTIFIED TO B.S. 116:1952

size	breaking capacity	making capacity	ASTA certificate
11kV	250 MVA	33.4 peak kA	3990
3.3kV	150 MVA	67 peak kA	3991

COMPLIES WITH B.E.B.S. -S2 and THE 250 MVA ADDENDUM

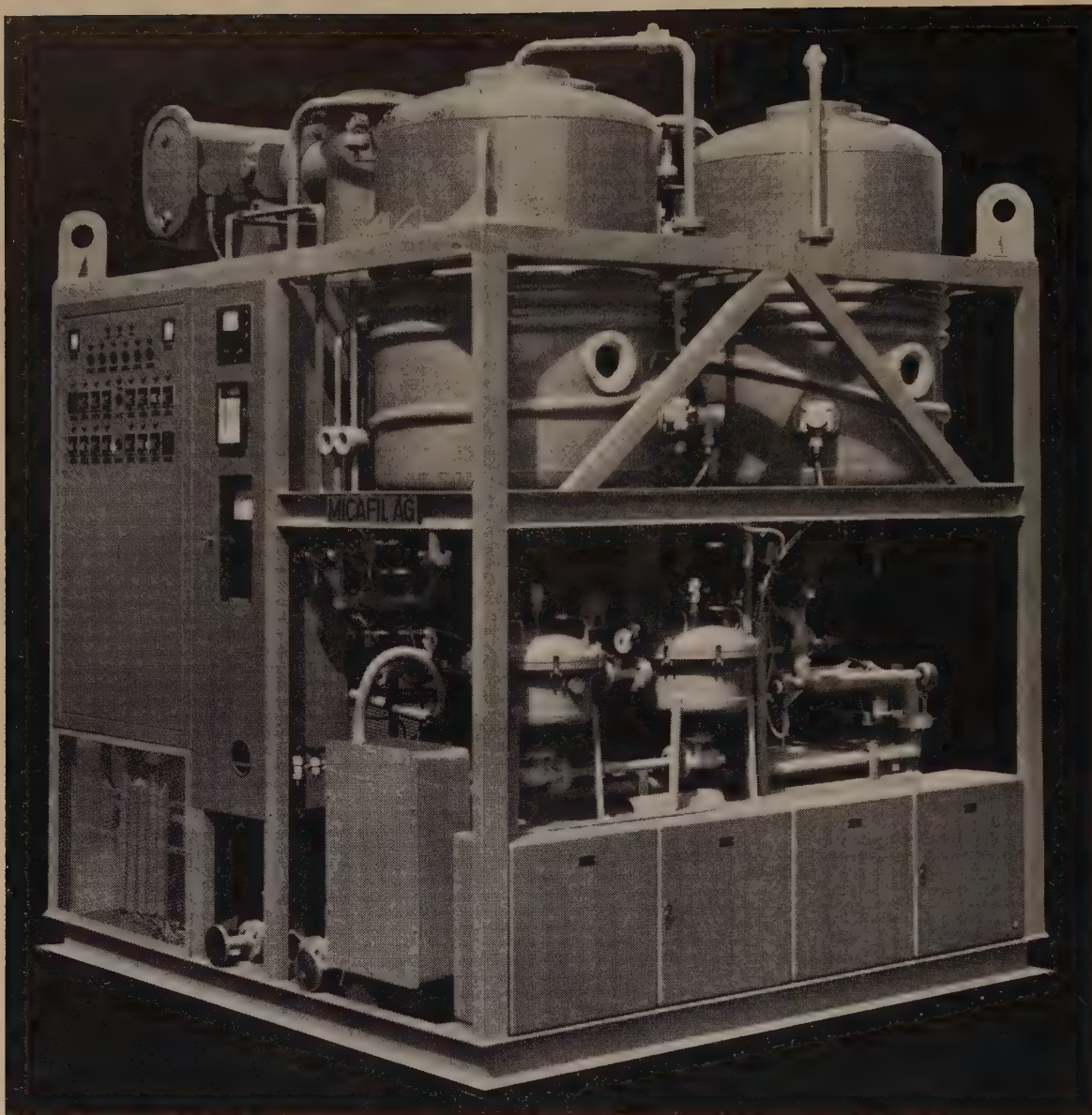


GEORGE ELLISON
LIMITED

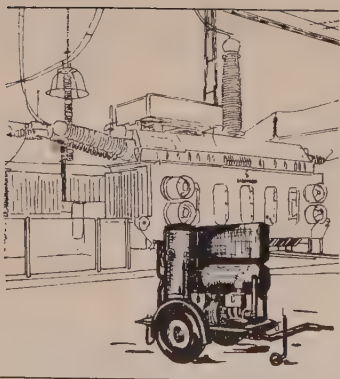
PERRY BARR • BIRMINGHAM 22B

May we send further information?

An engineer will gladly call.



Transformer Drying and Transformer Oil Conditioning Plants



Our specialists will help you to solve all problems connected with oil conditioning and drying of transformers. We have supplied oil conditioning plants all over the world, and past and wide experience will enable us to submit you our proposition for the most efficient solution. Upon request we shall gladly send you our pamphlet X 101 ER.

Micafil Ltd. Zurich Switzerland

British Agents: Fleischmann (London) Limited,
Chancery House, Chancery Lane, London W.C.2

**FOR PRINTING
INSTRUMENT
OR CLOCK DIALS
PRINTED
CIRCUITS etc.**



DURAMET

METAL PHOTO STENCIL SCREEN

The DURAMET metal photo stencil screen is an all-metal unit consisting of a metal stencil bonded to metal gauze. It is equally effective for printing on metal, plastic, wood and paper and gives results previously thought to be technically impossible.



MAIN FEATURES OF DURAMET

- many times the usual stencil life
- consistent fineness of detail
- complete freedom and choice of inks and washes
- dimensional stability ● thick and thin deposits

N. M. ROTHSCHILD & SONS

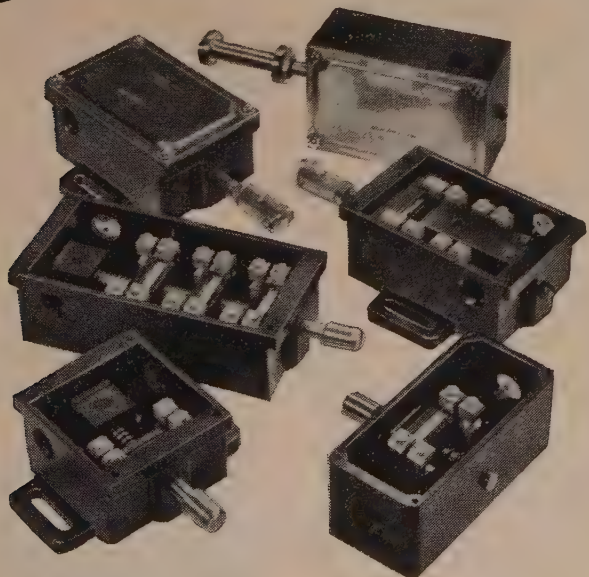
ROYAL MINT REFINERY

19 ROYAL MINT ST., LONDON, E.1. ROYAL 7061



"Colne"

**HEAVY DUTY
LIMIT SWITCHES**



Manufactured by

ASQUITH ELECTRICS (Colne) LTD.

formerly Colne Switchgear (K. & W.) Ltd.

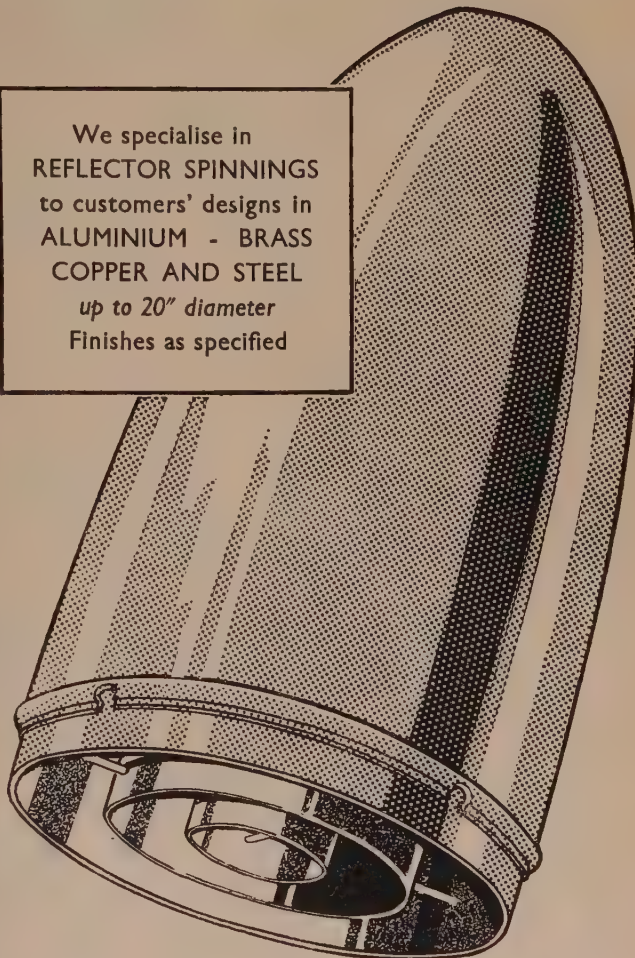
Walton Street, Colne, Lancs.

Telephone: Colne 1394/5

REFLECTOR SPINNINGS

to your designs

We specialise in
REFLECTOR SPINNINGS
to customers' designs in
ALUMINIUM - BRASS
COPPER AND STEEL
up to 20" diameter
Finishes as specified

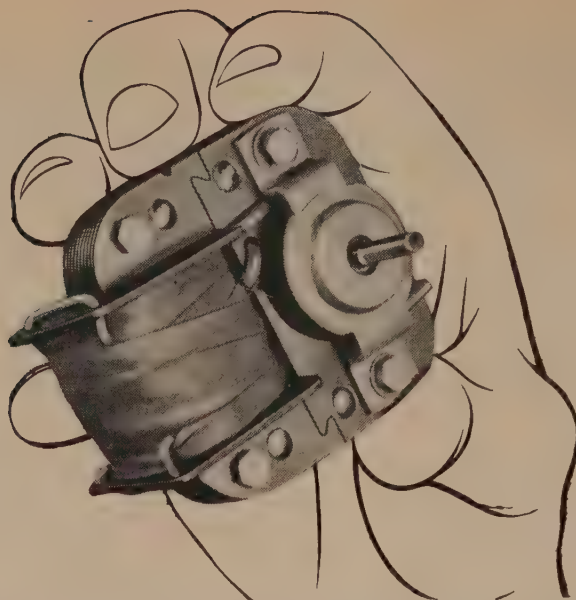


STOCKFIELD

MANUFACTURING CO. LTD.

**Morcom Road · Greet
Birmingham 11**

Telephone Acocks Green 2931



You've got to hand it to T.I.M

—when so many leading manufacturers specify T.I.M. motors in their products! You can't do better than hand your f.h. motor problems to us because we are small motor specialists. For information about shaded pole motors which are light, compact and utterly reliable, get in touch with . . .

MYCALEX and T.I.M. LTD
ASHCROFT ROAD, CIRENCESTER, GLOS.
Telephone: Cirencester 400

Mercury switches

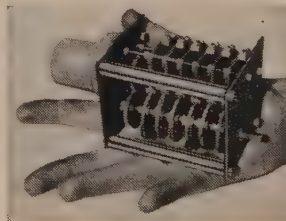
THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED are the largest specialised manufacturers of Mercury Switches in Great Britain. These are made to exceptionally high and uniform standards of quality.

Since its inception in 1932, this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design manufacture and application.

**THE MERCURY SWITCH
MANUFACTURING COMPANY LIMITED**
WEST DRAYTON • MIDDLESEX
West Drayton 3157

MS 12

MINIATURE CAM TIMER TYPE MSC



Overall dimensions of six cam unit 6 $\frac{3}{8}$ " x 3" x 3".

Every cam continuously adjustable.

Switching capacity 10 amps at 230v AC.

Standard unit can have 1-12 switches.

Standard timing cycles between five seconds and twenty-eight days.

ELECTRICAL REMOTE CONTROL CO. LIMITED
HARLOW NEW TOWN - ESSEX

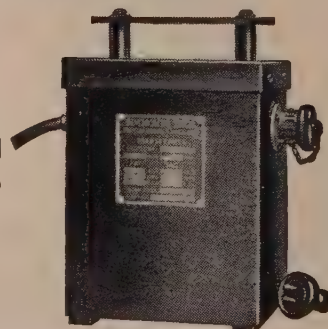
Tel.: Harlow 24032

VOLTAGE DROPPING TRANSFORMERS

For Electric Tools on
110 volts

Full range of fixed and portable types in all capacities, or made to specification. *List free*

**SIMMONDS BROS.
STOURBRIDGE**



PUT UP SIELECT

Fluorescent Lighting Fittings

PULL DOWN LIGHTING COSTS



Here are three good reasons why *you* will be particularly interested in the new SIELECT range of fluorescent lighting fittings:

- Low first cost
- Easy to install and maintain
- Adaptable and reliable

The range of models includes fittings both with and without reflectors and also an attractive reeded perspex diffuser design all in either single or twin lamp versions.

You'll want more information about Sielect fittings because they meet such a wide variety of commercial, industrial—and even domestic—needs, so send now for our folder PD11/F33.

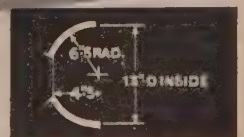


Following the reorganisation of the A.E.I. Group these products continue to be sold from former Siemens Edison Swan offices throughout the country. Our staff are unchanged and your enquiries and orders will be welcomed.

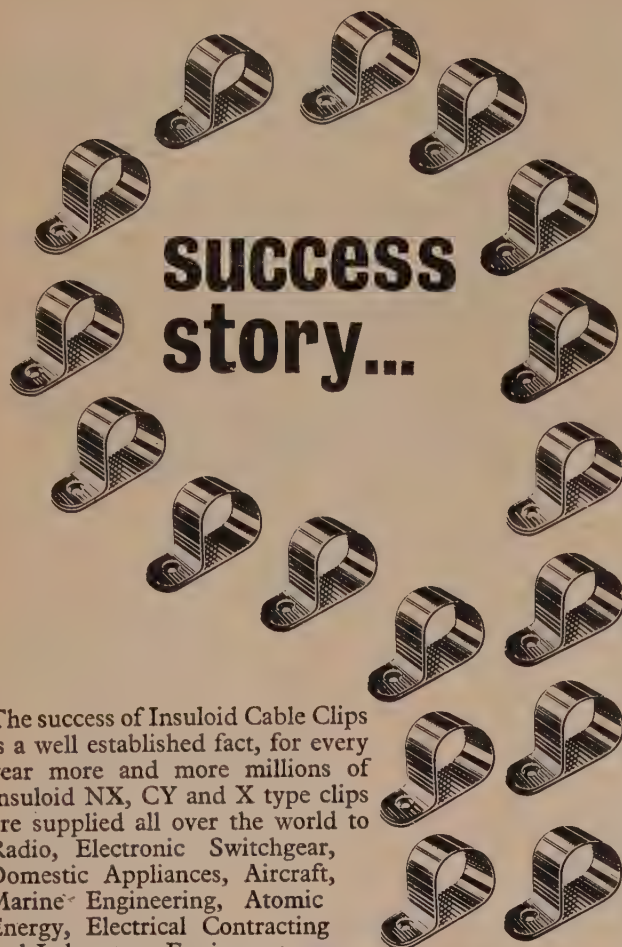


LAMPS AND LIGHTING

88/89 Upper Thames Street, London, E.C.4



CRC 11/71



**success
story...**

The success of Insuloid Cable Clips is a well established fact, for every year more and more millions of insuloid NX, CY and X type clips are supplied all over the world to Radio, Electronic Switchgear, Domestic Appliances, Aircraft, Marine Engineering, Atomic Energy, Electrical Contracting and Laboratory Equipment manufacturing industries.

In fact, wherever a high grade and secure fixing is required for cables, tubes or components whatever the climatic conditions.

Insuloid

CABLE CLIPS



NX CLIP
Made from the highest grade nylon, stronger than metal and twice as light, in sizes $\frac{1}{8}$ in. to 1 in. inside diameters.

CY CLIP
For dual cable runs in seventeen sizes, covering cable diameters $\frac{1}{8}$ in. up to $\frac{1}{2}$ in. In highest grade hard P.V.C.

X CLIP
Manufactured in highest grade hard P.V.C. in twenty-five different sizes from $\frac{1}{8}$ in. inside diameter to 2 in. inside diameter to cover the smallest and largest wiring runs.

Insuloid

RING LOCK BUSH

Here's a bush specially designed for instant assembly. The Insuloid simple snap-on finger action is as quick as a thought and once it's fixed it stays fixed, guaranteeing no chafing, and no tools are required whatsoever. Insuloid Ring Lock Bush is non-metallic, fully tropical, high dielectric, is approved by all services and is completely secure under all working conditions. Another Insuloid time-and-money-saving component.



Send for fully descriptive literature covering a full range of Insuloid Cable Clips and Ring Lock Bushes today.

INSULOID MANUFACTURING CO. LTD.

Sharston Works, Leastone Road, Wythenshawe, Manchester. Tel.: WYT 2842 & 3163

Come and see us on **Stand Z 8** at the A.S.E.E. Exhibition, Earls Court

**TERMINAL
BLOCKS**



Full ranges
up to 12-way

From 5 amp.
to 50 amp.

Litholite
Plastic Moulders
since 1901

LITHOLITE Insulators & St. Albans MOULDINGS LTD.
Sandown Road, WATFORD, Herts. Tel. WATFORD 23377

If you need

a small **METAL PRESSING** for your product, why not consult us?

We specialise in light precision presswork in all metals for the Electrical Trades.

QUOTATIONS BY RETURN

BIRMINGHAM SPECIALITIES LTD.
80-81 Bath Street, Birmingham 4. Phone: Central 2492



A.I.D.

Approved

TRANSFORMERS

of all types up to 25 kVA for Single or Three Phase operation, Phase conversion, etc.

MAINS

Output and Special Purpose Transformers for Radio Equipment, Chokes, etc.

COILS

for Contactors, E.M. Brakes, Air Valves, etc. and COIL WINDINGS for all purposes.

SOLENOIDS

for A.C. and D.C. Operation.

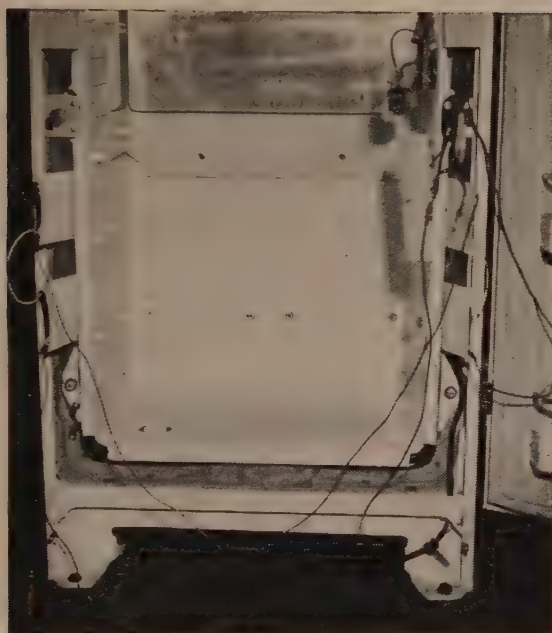
W. F. PARSONAGE & CO LTD
INDUCTA WORKS
PARK RD. BLOXWICH WALSALL
TELEPHONE: 2101, 76464

Prestcold use

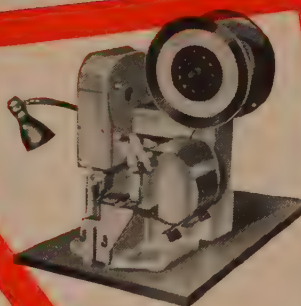
*AMP

*FASTON receptacles

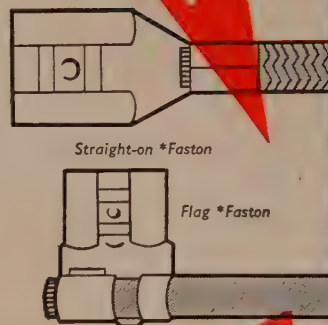
The illustration shows
refrigerator harness employing
*“Fastons” for quick and
easy assembly.



Refrigerator photograph by
courtesy of the “Prestcold”
Division of the Pressed Steel
Company Limited.



the means...



...to the end

▶ SPEEDY APPLICATION

▶ LOWER APPLIED COSTS

▶ UNIFORM HIGH QUALITY

▶ HIGH ELECTRICAL AND MECHANICAL STABILITY

WRITE NOW ABOUT THE CREATIVE APPROACH TO BETTER WIRING
AIRCRAFT-MARINE PRODUCTS (GT. BRITAIN) LTD.

Head Office: Amplo House, 87-89 Saffron Hill, London, E.C.1. Telephone: CHAncery 2902 (7 lines)

Works: SCOTTISH INDUSTRIAL ESTATES, PORT GLASGOW, SCOTLAND

*Trade Mark of AMP Incorporated, U.S.A.

AMP
TRADE MARK



CABLE DIVISION

UNITES THE RESOURCES OF THREE GREAT COMPANIES

**HENLEY
CABLES**

**LIVERPOOL
CABLES**

**SIEMENS
EDISWAN**

Three names having a long and honoured history in the manufacture and supply of every kind of wire and cable known to the Electrical Industry. Now, their resources, know-how, and manufacturing capacity are multiplied together to create something much greater than the sum of their individual facilities. Behind them the massive organisation of AEI will assure a steady flow of the latest technical data. There is no cable requirement too new, too big, too complicated, for this powerful and effective combination. By the same token, no order for ordinary small wires and cables is too small to have their ready and instant co-operation.

AEI

CABLE DIVISION

Associated Electrical Industries Limited

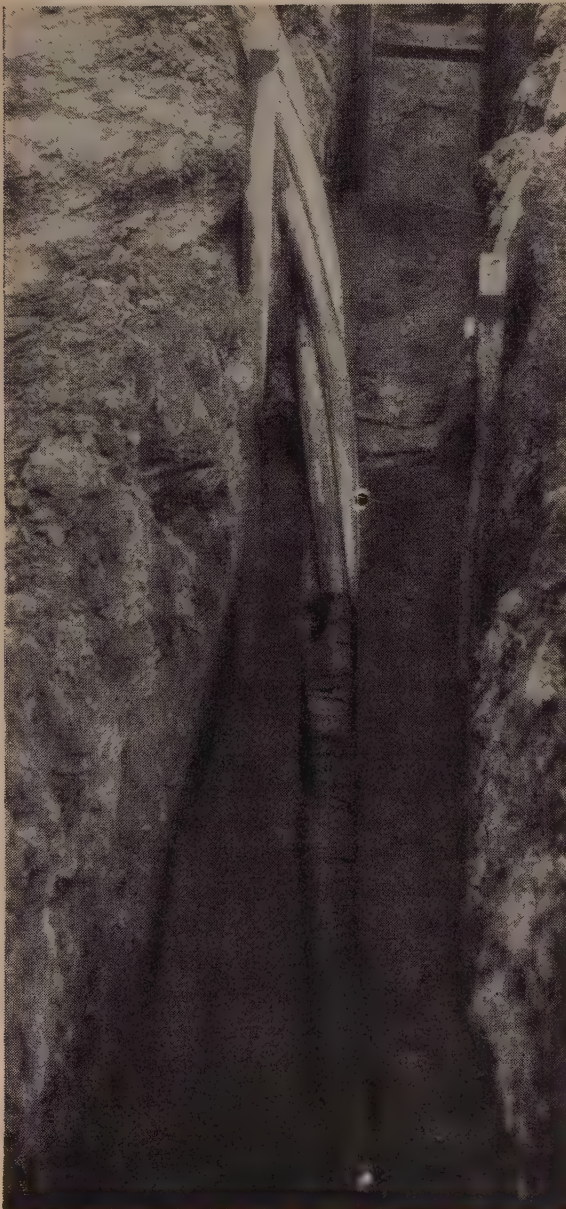
51-53 Hatton Garden • London E.C.1 • Phone: CHAncery 6822



In direct-burial installations **DU PONT neoprene**

protects cables from electrolytic and chemical attack

When a large utility company installed 35-Kv triplex cables to serve a nearby steel plant, the distribution engineers cut construction costs by burying the cables directly in the earth. They specified neoprene protective jackets to prevent deterioration of the lead sheath due to galvanic action and chemical corrosion. Utility companies have depended upon neoprene synthetic rubber for many years—for weatherproof wire and service drop cable, for control cable, network cable, power cable, and to protect lead sheaths. Of all resilient materials, only neoprene has balanced resistance to sunlight and weathering, oil and chemicals, heat, flex cracking, abrasion and cutting, oxidation, and ageing. Ask your supplier about wire and cable jacketed with neoprene, and send the coupon below for free copies of "What neoprene Is—and How It Protects Wire and Cable" and the "Elastomers Notebook", a periodical describing many applications of neoprene.



Cable is easily-fed into shallow trench. Neoprene covering protects lead sheath of cable from corrosion.



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DISTRIBUTORS: Du Pont Company (United Kingdom) Ltd., 76 Jermyn Street, London, S.W.1, England. (Electrical Review—1/60—G.B.)

Please send copy of "What neoprene Is—and How It Protects Wire and Cable" () and the "Elastomers Notebook" (). I am particularly interested in _____

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY _____

COUNTRY _____

More

for less... with the

MULTIMINOR

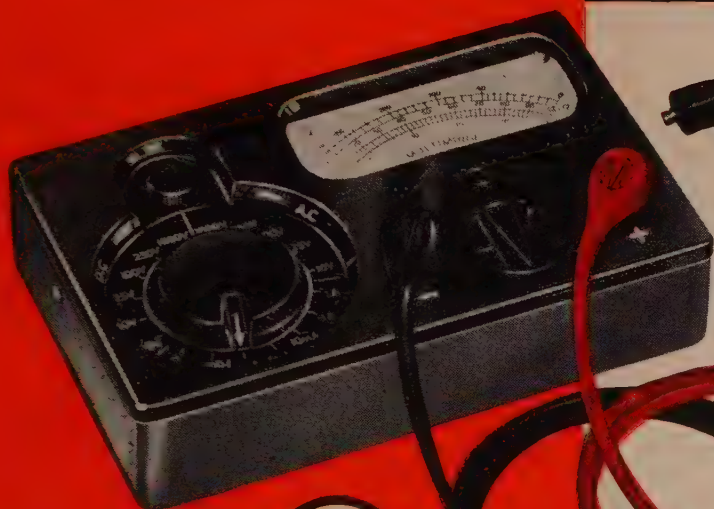


AVOCET
LTD

Designed to offer the widest possible range of accurate and reliable measurements at the lowest possible price, the versatility and usefulness of the Multiminor is now further extended by specially designed leads. These new leads, available at no extra cost, will accept crocodile clips or PRODCLIPS.

The Multiminor takes full advantage of the possibilities of printed circuit techniques to achieve outstanding compactness and economy of weight. The scale is clear and open. The fine red coloured pointer and effectively damped movement facilitate easy and rapid reading.

For use in Radio, TV, Electronics, Motor Vehicles, domestic appliances, workshop equipment, you'll find the Multiminor a great little meter!



Regd Trade Mark.

19 Ranges

D.C. Voltage
0—100mV.
0—2.5 V.
0—10 V.
0—25 V.
0—100 V.
0—250 V.
0—1000 V.

A.C. Voltage
0—10 V.
0—25 V.
0—100 V.
0—250 V.
0—1000 V.

Resistance
0—20,000Ω
0—2MΩ

D.C. Current
0—100μA
0—1mA
0—10mA
0—100mA
0—1 A

List price: £9:10s.

complete with Test Leads
and Crocodile Clips.
Leather case if required 39/-

Size: 5½×3½×1½ in.
Weight: 1 lb. approx.

Use PRODCLIPS (Pat. No. 748811) with the Multiminor

These cleverly designed spring-loaded insulated prods are the complete answer to a long-standing problem. Press the trigger to open, release to grip. Keep your hands free no matter how difficult of access your test points may be!

15/- per pair



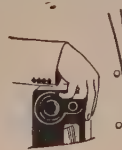
PHYSICAL SOCIETY EXHIBITION

January 18th—22nd. Stand No. 90
Royal Horticultural Halls, London, S.W.1

MULTIMINOR

AVO LTD

FITS THE POCKET



FILLS THE BILL

Write now for illustrated literature to:—

AVOCET HOUSE • 92-96 VAUXHALL BRIDGE ROAD • LONDON • S.W.1
VICtorIA 3404 (12 lines)

A MEMBER OF THE METAL INDUSTRIES GROUP OF COMPANIES

AMERICA orders testing equipment from FERRANTI LTD

A 14,000kVA A.C. High Voltage Cable Testing Equipment which will be the largest ever made in the United Kingdom has been ordered by the Anaconda Wire and Cable Company, Hastings-on-Hudson, New York, U.S.A. It will be used for routine production testing of cable up to 250,000 volts. The value of the order exceeds 250,000 dollars.

Ferranti Ltd. have specialised for many years in the manufacture of A.C. and D.C. Testing Equipments up to 1,000,000 volts and of Impulse Generators up to 4,000,000 volts.



Ferranti

*Pioneers of the Electrical Industry with over 75 years' experience
in research, development and manufacture*

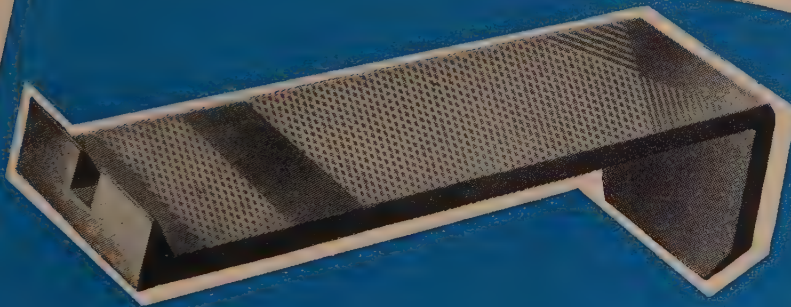
FERRANTI LTD • HOLLINWOOD • LANCASHIRE Telephone: Fallsworth 2000

London Office: KERN HOUSE • 36 KINGSWAY • W.C.2 Telephone: TEMple Bar 6666

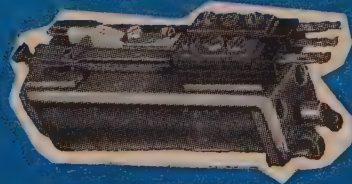
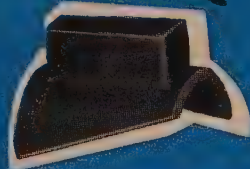
wise technicians
with 'know-how'
say

SUPER HIPERM

for solving
magnetic induction
problems



... Admirably meeting the stringent tests of the experienced electrical engineer, for Super Hiperm of Low Moor is triple refined under carefully controlled conditions, possesses ideal remanence and coercive force and provides maximum permeability. Magnetisation Curve and details of Application on request.



LOW MOOR
ALLOY STEELWORKS LIMITED

For Super Hiperm and Alloy and Special Steels
Low Moor Alloy Steelworks Ltd., Bradford, England. Tel.: Bradford 77331 (9 lines)
For Extrusions: Low Moor Fine Steels Ltd.

Powney/H7



Variac

Reg. Trade Mark

*the
original
continuously-adjustable
autotransformer*

VAR-5 is not an addition to our considerable range but a new catalogue now available containing details of the full series including a number of recently developed "Variacs" for both light and heavy loads.

Designers will find it of great assistance for their voltage control problems within the range 60 VA to 25.2 kVA; larger loads up to 42 kVA are covered by multiple ganging.

If you have not received a copy may we send one for your personal attention?

ALL toroidal "Variac" transformers are wound on strip cores for minimum losses, the contact tracks (except Series '50') receiving the exclusive

"Duratrak" process (British Patent No. 693406) which gives longer life and greater overload capacity, as shown on page 3.

Many of the more popular sizes are held in stock, others being manufactured to order; our Works are designed to produce promptly any type within the range offered.

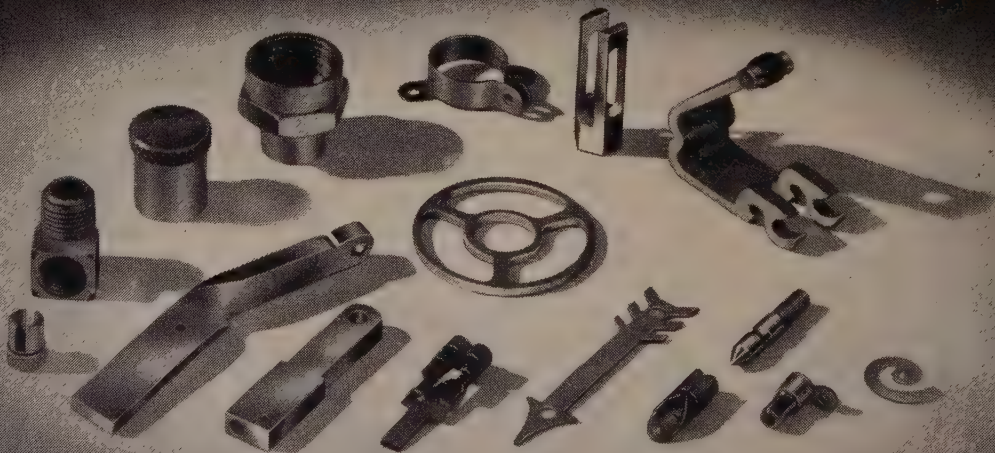
PRICE REDUCTIONS Several models in the Series 'V' are now available at lower prices. A new Model 'V3H', suitable for 240 volts 50 cycles and giving zero to 270 volts at 1 ampere, is detailed on page 4, and is economically priced although built to the same high standard.

THE ZENITH ELECTRIC COMPANY LTD.

ZENITH WORKS VILLIERS ROAD WILLESDEN GREEN LONDON N.W.2
Telephone: WILlesden 6581-5 Telegrams: Voltaohm, Norphone, London

MANUFACTURERS OF ELECTRICAL EQUIPMENT INCLUDING RADIO AND TELEVISION COMPONENTS

METAL PARTS



REPETITION PARTS IN ALL METALS, AUTOMATIC AND CAPSTAN TURNED PARTS, COMPLETE ASSEMBLIES
PRESSINGS, ADAPTORS, TERMINALS, SOCKETS, CONTACTS, CLIPS, PIPEFITTINGS, UNIONS, SPRINGS
TAGS, FLEXIBLE CONNECTORS, ETC.

PAXTONS (ELECTRICAL) LTD

WESTON - SUPER - MARE

TEL. 1357

AID & ARB APPROVED



Oilite

Ferrous alloys for hard
wearing structural parts

Oilite

Superload for resisting high
pressures and heavy shock
loads

Oilite

Standard Bronze Bearings
in large or small quantities

Oilite

Brass for plated parts

Oilite

Iron bearings for strength
and low cost

OVER A
MILLION
BEARINGS
IN MORE THAN
A THOUSAND
DIFFERENT
SIZES

self-lubricating bearings and powder metal parts

Oilite

Precision finished machine parts and self-lubricating bearings are supplied in a variety of alloys produced by modern methods of powder metallurgy. Many bearings are available from stock and we will gladly undertake special production where quantities warrant the preparation of tooling. Cored and Solid bar, and plate stock can be supplied for small quantity production.

Please write for further details and technical data.



*Magnet frame for 4,000 h.p.
Mill Motor treated with
P.J. Black Sealing and
Finishing Varnish
By kind permission of
General Electric Co. Ltd., Birmingham*

Additions are continually made to our range of specialised insulating varnishes and electrical machinery finishes. Recent research has largely been concerned with exploiting the latest synthetic resins, and many new formulations with characteristics of considerable interest to the electrical industry have been evolved in our laboratories. Requests for further information, or specific enquiries regarding insulating problems, should be addressed to our Insulating Varnish Department.

STOVING VARNISHES

(Natural Resin Type) (Synthetic Resin Type)

THERMO-SETTING VARNISHES • SOLVENTLESS VARNISHES

AIR-DRYING VARNISHES • CLOTH VARNISHES

CORE-PLATE VARNISHES (Stoving and Air Drying)

COPPER WIRE ENAMELS (Oleo-resinous and Synthetic Types)

All the above are supplied in black and clear.

ACID AND HEAT RESISTING ENAMELS. *Available in all colours.*

MICA BONDING VARNISHES • COIL STICKING VARNISHES

SLEEVING VARNISHES (Black, Clear and Colours)

CABLE LACQUERS (Non-flam., Cellulose Type and P.V.C.)

COMPOUNDS (Various Types)

All the materials listed conform to B.S. Specifications wherever applicable.

PINCHIN, JOHNSON & COMPANY

4 CARLTON GARDENS • LONDON S.W.1 TELEPHONE TRAFALGAR 5600

Branches: Belfast, Birmingham, Bootle, Brighton, Bristol, Glasgow, Leeds, Manchester, Newcastle-on-Tyne & Southampton



introducing...

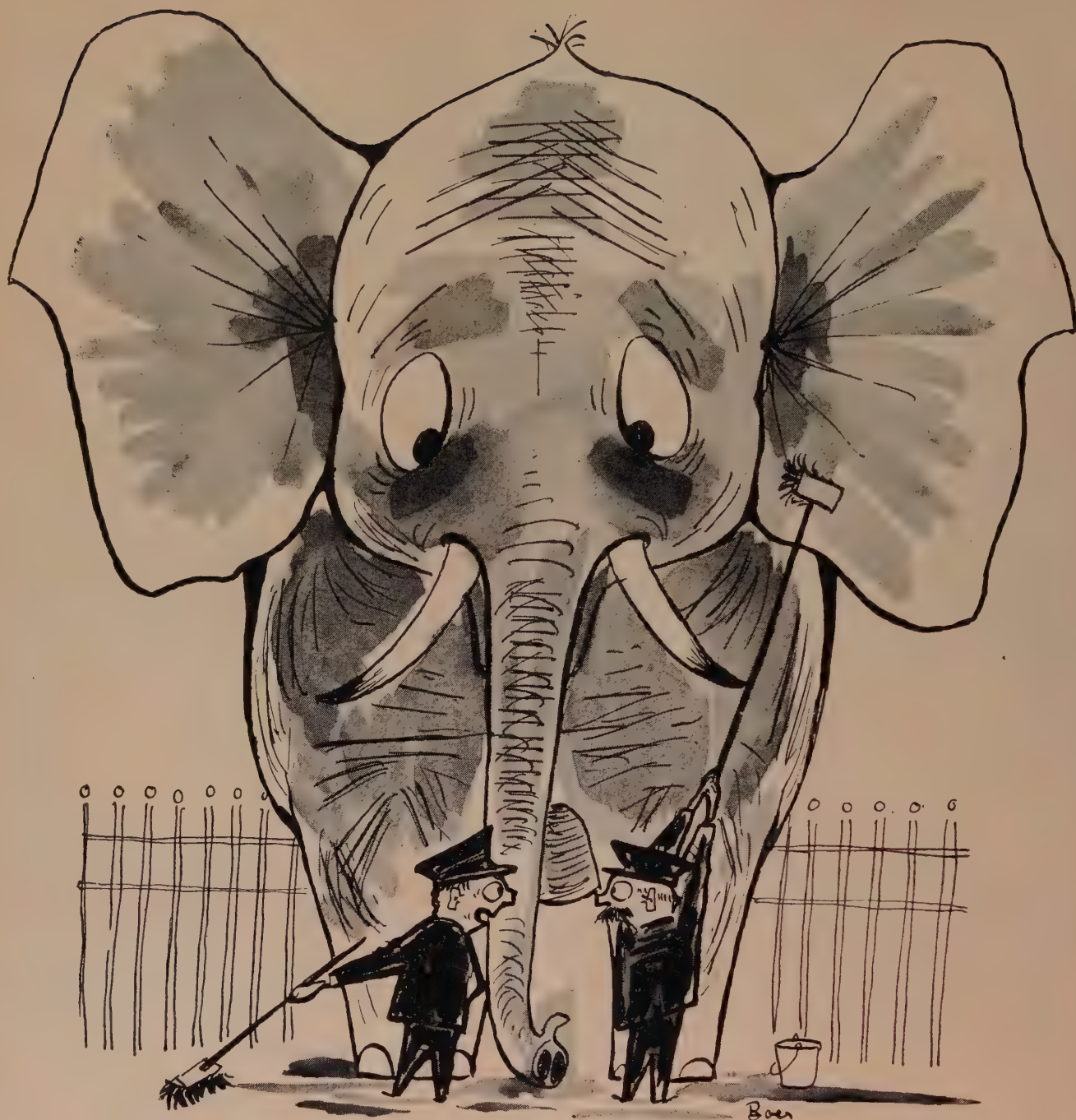
... .. the new type-BA semaphore indicator for the automatic indication of the position of circuit-breakers and isolators.

The operating-coils of these indicators are continuously-rated but built-in contacts break the circuit on completion of movement to prevent unnecessary drain on battery supplies.

This semaphore indicator plugs in from the front of the panel and is available with discs of either 1½" or 2½" diameter.

Reyrolle

A. REYROLLE & COMPANY LIMITED - HEBBURN - COUNTY DURHAM - ENGLAND



For your ears alone I tell's him straight. Elephants is mass production jobs, I says. No finish to 'em! That don't suit him right at all so he offs to that Symonds outfit. Now a trunk call to him means copper wire—miles of it, and every inch tested proper. Precision stuff, that's what he deals with. As for this 'ere elephant—its just an 'orrible mistake.

Serious enquiries please to



47 Victoria St., S.W.1. Tel: Abbey 2771/5



RELIABILITY

IN THE MAKING

In common with other Worthington-Simpson products, our condensing plant is manufactured with precision from the highest quality materials and is designed to give long and reliable service.

Specialists in the Worthington-Simpson organisation deal with all problems of heat exchange. We have considerable experience in producing condensing plant for high vacua and feed systems operating at the highest pressures and temperatures.

Complete systems are designed, manufactured, erected and installed, including auxiliary plant—condensers, air ejectors, feed heaters, evaporators, de-aerators, fuel oil heaters, and water coolers for both land and marine installations.

Worthington - Simpson Ltd.

NEWARK NOTTS



PUMPS • COMPRESSORS • HEAT EXCHANGE EQUIPMENT

Space Heater Elements

Washing Machine Elements

TETRA

TUBULAR SHEATHED MINERAL EMBEDDED ELEMENTS

Kettle Elements

Water Heater Elements

Space Heater Elements

Tetra elements can be produced to customers' own requirements and to conform with recognised British and Overseas Standards. Technical department available for advice and assistance in design.

These finned elements can be supplied in lengths up to 12ft.-14ft. and are available in copper, mild or stainless steel and aluminium, straight or bent to requirements.



NEW FLAT CONNECTOR

Specially designed for the highly loaded kettle element. Conforms to BS.562/10 amps. Samples available on request.

THE TETRA ENGINEERING CO. LTD. TETRA WORKS - NORTH END RD. - WEMBLEY - MIDDX. Tel.: WEMbley 1066 (5 lines)

Precision

ALL
AUTOMATIC
AND
CAPSTAN
TURNED
PRODUCTS

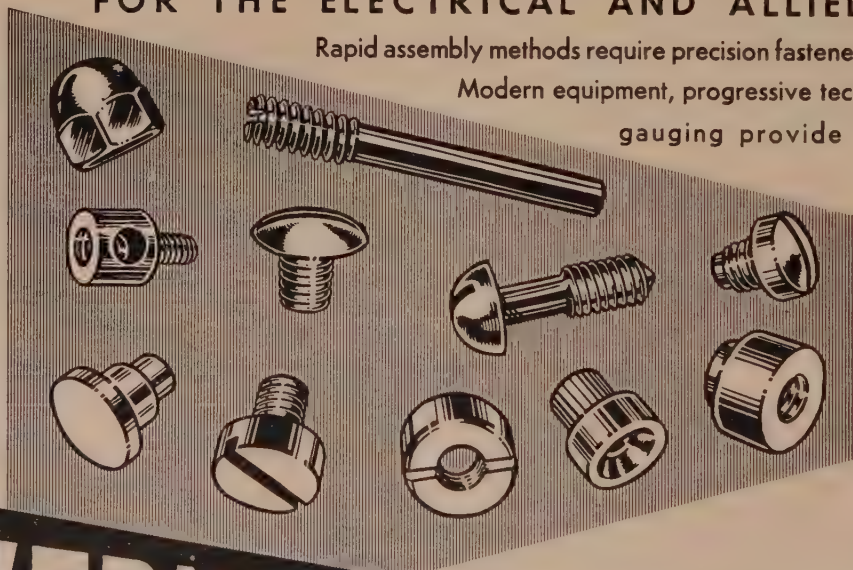
STOCKS
of standard
turned screws
available for
immediate use

TURNED FASTENERS

FOR THE ELECTRICAL AND ALLIED TRADES

Rapid assembly methods require precision fasteners and components.

Modern equipment, progressive technique, and quality gauging provide an unsurpassed specialist service.



VERNIER

MANUFACTURING CO. LTD.

15-19 Garman Road, London, N.17

Telephone: Tottenham 5077

BOWATER

CHOSE

BELMOS

MOTOR CONTROL GEAR



Belmos medium-voltage motor control gear is installed on the newly commissioned Nos. 5 and 6 Machines and in the Grinder House of the Bowater Organisation's Mersey Division Plant at Ellesmere Port for the control of auxiliary services.


Universal recognition that the design, finish and performance of Belmos products make them unique in the combination of these qualities is reflected in the ever-increasing number of industries which depend on Belmos to meet their control gear requirements.

Belmos

the Belmos company limited

B E L L S H I L L - L A N A R K S H I R E

L O N D O N G L A S G O W B I R M I N G H A M N E W C A S T L E M A N C H E S T E R S H E F F I E L D C A R D I F F



**MOST EFFICIENT
method of fixing
ELECTRIC WIRES & CABLES**

'HARCO'
PERFORATED MILD STEEL
**CABLE
TRAYS**

provide a continuous chassis for the efficient attachment of cables and wires. With the Cable Trays once in position, subsequent alterations and additions to the wiring can be speedily effected at minimum cost, without drilling or plugging.

Trays and bends are available from 2 in. to 36 in. wide; the standard length of trays is 8 ft.

Strongly constructed of mild steel plate, and supplied self-colour, painted, hot-dip galvanized or plastic coated as required.

Send for List No. 1003 to:

**G. A. HARVEY & CO.
(LONDON) LTD.
WOOLWICH RD., LONDON, S.E.7
Telephone: GRGreenwich 3232 (22 lines)**

HARVEY

Other HARVEY Facilities and Products: PERFORATED METALS · WOVEN WIRE · WIREWORK · LARGE MACHINE SHOP FACILITIES · FABRICATIONS IN ALL METALS · STEEL SHELVING AND STORAGE EQUIPMENT · GALVANIZING · ETC.

1960

it's a LEAP year

and a year when

JACKSON

LEAPS
ahead

with the excitingly modern



Electric Cooker

and Susan introduces...



The new **HIGHLOWE** Electric Cooker —even faster



494T

IN WHITE OR
CREAM

**THE COOKER THAT
HAS EVERYTHING—**

- Eye-level grill
- Automatic oven timer
- 4 SPEEDRINGS—
1 Very High Speed—
each with 6 heat control
- Large oven with automatic
light, glass door, and
roof protector
- Vitreous enamel roasting pan
- Huge heated cupboard
with removable wire basket
- Mobile plinth: £3 extra

£56

On price alone—the



cleaner, easier to control, PLUS real value-for-money!



- Eye-level grill
- Automatic oven timer
- 3 SPEEDRINGS—
1 Very High Speed—
each with 6 heat control
- Large oven with glass door
and roof protector—
no oven light
- Vitreous enamel roasting pan
- Huge heated cupboard
with removable wire basket
- Mobile plinth: £3 extra

MOBILE PLINTH

Fitted with castors—raises
hob height from 33½" to 36"

£51

IN WHITE OR
CREAM

493T

out-values all other cookers

Every



is fitted with



493

IN WHITE OR
CREAM

- Eye-level grill
- 3 SPEEDRINGS—
1 Very High Speed—
each with 6 heat control
- Large oven with glass door
and roof protector
(no timer or light)
- Vitreous enamel roasting pan
- Huge heated cupboard
with removable wire basket
- Mobile plinth: £3 extra

All models are 33½" to hob—
with mobile plinth hob is raised to 36"

£45

For looks, speed and value—the

fast-boiling *SPEEDRINGS*

Look at this super-clean hob

Fixed plates form a seal between
hob and bezel

Spillage cannot penetrate below
hob and is easily mopped up

No deflectors to clean

1 VHS (Very High Speed) Speed-
ring with automatic thermal device
(2,400 watts cuts down to 1,200
if plate is misused)

7.1" Speedring holds average
7" saucepan without wasted rim
of heat

6 heat control for all types of
cooking

Hob height 33½", with
mobile plinth 36"



And here's how
Susan will tell your
customers about
the Highline



is years ahead of its time

Massive press, T V and point of sale advertising will introduce British housewives to the sensational new JACKSON Highline Electric Cooker

Large space advertisements in Britain's leading publications with over 80 million readers

- The People
- Sunday Express
- Sunday Pictorial
- Empire News
- Glasgow Sunday Post
- Radio Times
- T V Times

Advertised on all
Commercial T V Stations

Full colour page advertisements in these periodicals

- Good Housekeeping
- Ideal Home
- Homes & Gardens
- House Beautiful
- Housewife

Colourful display
material for your showroom

Booklets and leaflets
for your customers

...and when Susan grows up

the

JACKSON

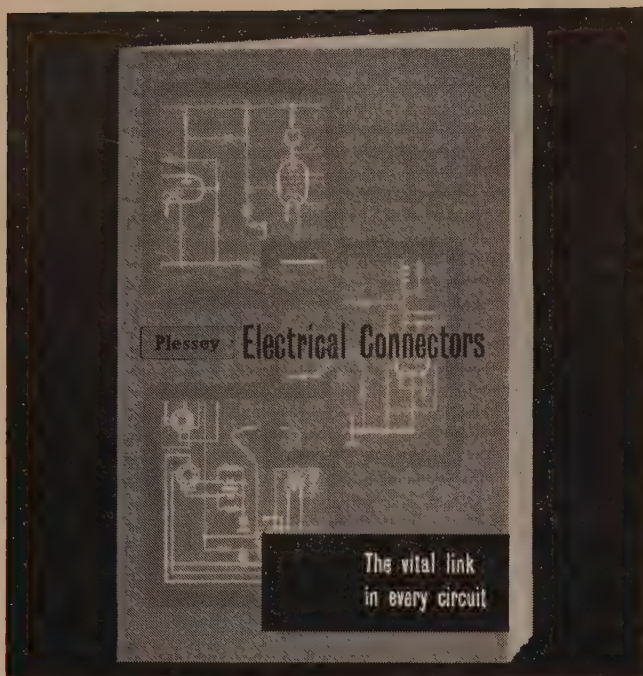


will **STILL** be modern

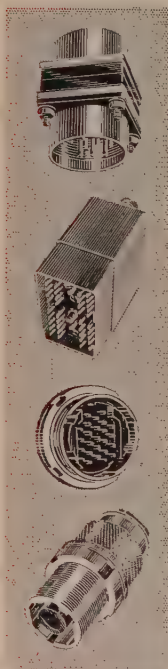


494 T

Electrical Division of **Radiation** Ltd.,
255 North Circular Road, London, N.W.10



You'll need this booklet...



when you are faced with the problem of finding exactly the right type of Connector for a particular job.

It provides abridged data on the wide range of Plugs and Sockets manufactured by Plessey, and lists the publications which are available on various types.

Selection is simplified even further by means of the Selection Guide enclosed with the booklet. It lists fully the main characteristics of each of 16 different ranges.

If you have a need for Plugs and Sockets you also have a need for this information.

Write today for a copy of Publication 148.

Plessey

**Electrical
connectors**



**Wiring and Connectors Division
The Plessey Company Limited**
Cheney Manor · Swindon · Wilts
Telephone: Swindon 6251

Overseas Sales Organisation:
PLESSEY INTERNATIONAL LIMITED · ILFORD · ESSEX

CWS

When it's a
question of

**FIRE
ALARMS..**

For Manual Contacts,
Bells and Indicators,
Automatic Detectors,
come to the manufacturers
with sixty years' experience,
trained staff and the most
up-to-date equipment.

In brief

write for
catalogue
to.....



ASSOCIATED FIRE ALARMS LTD.,
Claremont Road, London, E.17. *Service throughout U.K.*

Branches in Bristol · Birmingham · Edinburgh · Glasgow · Leeds
Leicester · Liverpool · N. London · S. London · Manchester
TAS/AF.146c

40 VOLTS/SEC AUTOMATIC CORRECTION

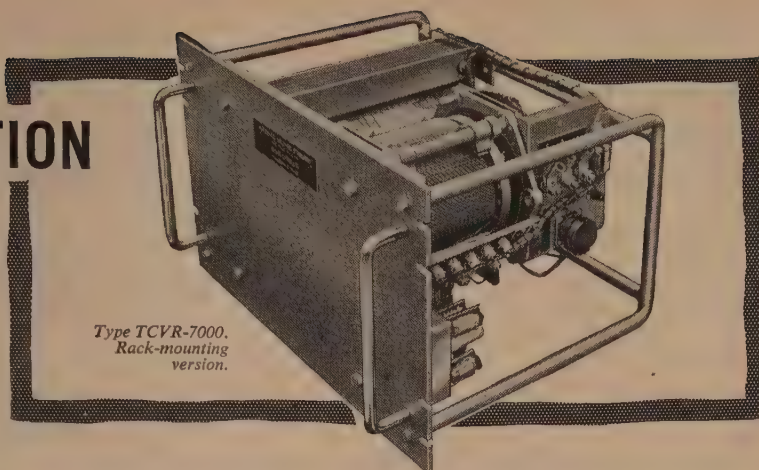
—with the type
TCVR voltage regulator

The TCVR is a servomechanical automatic voltage regulator having the very high speed of correction of FORTY VOLTS PER SECOND. It provides an undistorted output, maintained constant within very close limits (normally $\pm 0.5\%$) from no-load to full-load, for wide variations in frequency and power factor.

A wide range of models from 1.6 to 12 kVA single-phase, and 4.8 to 36 kVA three-phase, is available, to standard or tropical specification, in cabinets or for rack-mounting. Models are also available in which the output voltage is continuously adjustable over a wide range by means of a panel control. Regulators can be supplied to Services' specification, and special models can be designed to order.

For high-speed, accurate stabilisation without distortion—specify TCVR.

Claude Lyons Ltd.



Type TCVR-7000.
Rack-mounting
version.

Other products of Claude Lyons Ltd. Stabiliser Division

BMVR: Motor-driven laboratory and industrial regulators ranging from 1.6 to 29 kVA single-phase, and 4.8 to 87 kVA three-phase. Constancy of output normally $\pm 0.5\%$, from no-load to full-load. No distortion. Speed of correction 1 Volt/Sec. A great variety of models, standard, tropical and militarised, for all applications.

BAVR: Electronic stabilisers of very high accuracy, and very rapid response, with no moving parts. Input range: -10% to $+5\%$, output constancy $\pm 0.15\%$. Three sizes: 200, 500 & 1000 VA. Exceptionally useful for control of chemical processes, heating, lighting, etc.

ASR: Automatic step regulators, small, inexpensive, and with sinusoidal output waveform. Two sizes: 1.15 kVA and 2.3 kVA. Input range -10% to $+5\%$; output constancy, $\pm 2\%$.

ATC: Automatic Tap-Changing Transformers—a development of ASR. Two sizes: 575 VA and 1150 VA. Input range -20% to $+10\%$; output constancy, $\pm 5\%$. Provide adequate stabilisation for many types of apparatus, at low cost. Also useful as pre-regulators, e.g. in conjunction with BAVR.

We shall be pleased to send you full details of our entire range.

Stabiliser Division VALLEY WORKS • HODDESDON • HERTS • TELEPHONE HODdesdon 4541-4
CLJ/47/E2B

Introducing — “The Rioway”

★ Something new
and distinctive
in pedestal fires!

Visit us on Stand N.12
A.S.E.E. Exhibition, Earls Court
5th—9th April, 1960

The elegant “Rioway”
has the touch of quality
about it. All metal parts
are extra heavy gauge, from
the heavily plated front grille to
the attractive beige enamelled base



● RETAIL PRICE

42/4

Plus 7/7 P.T.



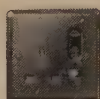






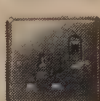






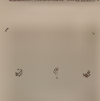
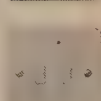


Cat. No. DAE/424

● THE 750 W LOADING AND MODERATE PRICE MAKE
THE “RIOWAY” THE IDEAL ALL-PURPOSE REFLECTOR FIRE

METWAY

KEMP TOWN

BRIGHTON

Whether it's a socket-outlet				
switchsocket-outlet				
pilot-lamp switchsocket-outlet				
rated at 2, 5, 13 or 15 amperes				
with brass plate finished BMA or matt chrome				
or moulded in brown or ivory				
whether it's a fused spur-box				
with a switch		or a pilot-lamp		
a water-heater switch				
a one or two gang Plateswitch				
or even a clock connector				
MK make a design to fit the				
standard box with $2\frac{3}{8}$ " centres				

.....(and all the many 1 and 2 gang MK Gridswitch combinations also have $2\frac{3}{8}$ " centres)

M. K. ELECTRIC LIMITED
EDMONTON, LONDON EDMONTON 5151



FRIDAY
15 JANUARY
1960

ELECTRICAL REVIEW

Managing Editor:
HUGH S. POCOCK, M.I.E.E.

General Editor:
J. H. COSENS

Technical Editor:
A. R. POLLARD, A.M.I.E.E.

IN THIS ISSUE

Meeting the Demand	91	The demand for electricity in this country doubles every ten years and the Central Electricity Generating Board has installed plant in increasingly large units to keep pace with this demand. Some difficulties may arise in the future if 120 MW re-heat sets are operated on a peak-load basis. Greater use of pumped storage might be the ideal solution to this problem
From Logs to Paper	93	To provide the power required for a £15 million extension, new boiler plant with a total rating of 270 klb/hr and a 15 MW pass-out turbo-alternator have been installed at the Bowater Mersey Division
Induction Motor Losses	103	A method of determining the rotational iron losses over a wide range of slip frequency is discussed, and the theory behind the experimental results is given
Lisbon Underground Railway	107	Description of the power supply, ventilating and pumping equipment, and h.v. cable contracts carried out by the General Electric Co., Ltd., for the Metro-politano de Lisbon Railway
Heat from Modern Electric Lamps	109	In a statement issued by the Cable Makers' Association it is pointed out that the reduction in the envelope size of g.l.s. lamps, permitting the use of higher wattage lamps in fittings designed for the old lamp ratings, can give rise to premature failure of the insulation of the connecting cable
Hirfanli Hydro-Electric Project	111	Officially inaugurated on 8th January by the Prime Minister of Turkey, this project includes a dam 1,200ft long across the River Kizilmirmak. The power station houses three 36.8 MW English Electric turbo-generators
Power Factor Improvement	127	This article deals with the economics of power factor improvement and the fields of application of the different types of correction equipment used

550 MW Turbo-Generator	100	Financial Section	122
Electrical Services in Housing	101	New Electrical Equipment	132
Views on the News	106	New Patents	134
Letters to the Editor	110	United States Electrical Trade	135
Industrial News	112	Next Week's Events	137
Generation and Development	116	Contract Information	138
A.E.I. Reorganisation	118	CLASSIFIED ADVERTISEMENTS	115
Personal and Social	119	INDEX TO ADVERTISERS	128

VOLUME 166 NUMBER 3

Eighty-Eighth Year of Publication

FRIDAY PRICE 1s 6d

© Electrical Review Publications Ltd. 1960. Permission in writing from the Editor must first be obtained before letterpress or illustrations are reproduced from this journal. Brief abstracts or comments are allowed provided acknowledgment to the journal is given.

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telephone No. Waterloo 3333 (65 lines). Registered at the General Post Office as a Newspaper. Annual Subscription: Home £4 0s 0d; Overseas £5 15s 0d; U.S.A. and Canada \$16.00. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Entered as Second Class Matter at the New York, U.S.A., Post Office. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD., and crossed "Coutts & Co."

ALL SPICK and SPAN

WITH **NEWSPAN**

AT TESCO'S FOOD WAREHOUSE



- Up to 3000 lbs. per shelf.
- Strong Steel Shelves in 8 sizes from 48" x 42".
- Punched Angle Uprights in 5 Standard Heights 72" — 120" (or in special lengths).

*For best Storage Results—
it must be*



SEND FOR THE FREE, FULLY ILLUSTRATED NEWSPAN BROCHURE



AND AT THE BRISTOL AIRCRAFT CO. LTD.

... and many other factories and warehouses are using Newspan to solve their storage problems. Newspan — the storage equipment that brings order and efficiency quickly and cheaply, with more than 350 combinations from standard parts, and shelf reinforcements that permit loading of up to 3000 lbs. per shelf.

*Don't Wait, Storage Problems Thrive on Delay —
tell us your problem today.*

NORWOOD STEEL EQUIPMENT LTD.
HOWARD WAY, HARLOW, ESSEX

London Display Centre: 149 Borough High Street, London, S.E.1
and at Bristol, Manchester and Birmingham.

The solution to YOUR wiring problems

ELECTRICAL TRUNKING

the modern surface distribution system

Channel Conduit is a fully patented system designed to overcome difficulties and disadvantages in existing layouts using the ordinary barrel type conduit. As an alternative to multiple barrel conduit runs it effects a substantial saving in material and labour.

It is ideal where a large number of wires are used and is indispensable where future alterations and extensions are likely to be required. Used by Government departments, including the Admiralty. Approved by the Postmaster General.

May be run on the surface of walls or ceilings without interference to existing current supply and can be painted to match existing colour schemes. Write for leaflet No. RA.168.

CHANNEL "Spring Capped" CONDUIT



THE NEW ADAPTABLE FLOOR SYSTEM for office and factory

"Pancake" — a new system designed to overcome the hazards of trailing flexes and cables. With the use of this ducting telephone and lighting points may be extended neatly and safely across the surface of the floor. The ducting is enclosed and protected by specially shaped capping of tough hardened rubber. An adhesive can be supplied to fix the underside of the capping to the floor. A complete layout when assembled, forms a neat, inexpensive, but robust system capable of standing up to rough usage. Write for leaflet No. PC.24.

PANCAKE
TRADE MARK
BRITISH PATENT NO. 772,82

over-floor
DUCTING

CHANNEL CONDUITS LTD., STATION ROAD, WINSLOW, BLETCHLEY, BUCKS.

Telephone: Winslow 337

ELECTRICAL REVIEW

15 January 1960 Vol. 166 No. 3 Established 1872

Meeting the Demand

WE recently pointed out that if the demand for electrical power continued to increase at its present rate and doubled between now and 1970, the supply authorities in this country would have to install generating plant to the extent of nearly 2,500 MW of plant each year. We are certain that this can and will be done. An indication of the progress which is being made in this direction is given by the details on page 116 of this issue of the new generating plant installed by the Central Electricity Generating Board during 1959. It will be seen that during this period 1,775 MW of new generating plant was put into service. This is an encouraging increase on the previous year's figure of 1,230 MW but it is by no means a record since, in 1956, 1,920 MW of plant was commissioned. The increasing use of larger generating units is well illustrated by the fact that in 1956 thirty-eight generating sets were involved while last year the number was only twenty-one and for very nearly the same output capacity.

Since the end of the war the "standard" size of generating unit has been 60 MW and, in fact, a few of these sets are still being installed, but only in existing stations nearing completion. It is unlikely that any future station will make use of this size of generating unit, mainly because of the economic advantages of using larger sets. The 100 MW generating unit appears to have been a transitional size paving the way for the 120 MW unit which looks as though it will be the "bread and butter" size of the future, despite the fact that very much larger machines have been designed and ordered; for instance, 200, 275, 300 and 350 MW on one shaft, and 550 MW cross-compound with two shafts.

The fact remains, however, that 120 MW is still a very large size although the loss of such a unit would not have serious consequences on the supply network. It has been proved on smaller systems abroad that it is safe to include individual generating units with ratings up to 10 per cent of the total system capacity. If for any reason such a generator drops out there is no undue disturbance on the network and in view of the economies of employing very large generating units we confidently expect that a 1,000 MW unit will be placed on order by the C.E.G.B. and possibly commissioned some time during the late 'sixties. However, the day will undoubtedly come when 120 MW sets will be used for peak-load operation and one cannot help wondering whether or not this will give rise to difficulties. All the generating units of this size so far installed operate on the re-heat cycle and it is generally

accepted that for peak-load operation the "straight" set has the economic advantage over the re-heat unit.

For some years to come all nuclear generating plant will be employed to carry base load, as will also the larger thermal units. Thus it would appear that most of the generating plant at present being installed in this country will be better suited to base-load than to peak-load operation. We wonder whether this problem has received sufficient consideration by the C.E.G.B. Neglecting the possibility of practicable developments in connection with fuel cells, thermo-electric and thermionic generators, magnetohydrodynamics, thermo-nuclear fusion devices and so forth, it would appear that the provision of peak-load power in the most economic manner is limited to pumped storage schemes operating on a daily cycle. So far only one scheme of this type is under construction by the C.E.G.B., a 300 MW plant at Ffestiniog in North Wales, and the North of Scotland Hydro-Electric Board has just started civil works for a 400 MW plant at Loch Awe. Perhaps as suitable sites for pumped storage schemes are very hard to find, a different approach might be made to the problem. Pumped storage schemes of almost unlimited size could be constructed if sea water were used and there must be many places around our coasts in which such schemes might be possible.

I.E.E. STANDARDS

In a leaderette last week, we commented on the statement issued by the Electrical Power Engineers' Association on training and referred to the lack of sufficient apprentices within the supply industry itself. We felt that this was a more important point than the suggestion contained in the statement that the Electricity Council should ask the Institution of Electrical Engineers to reconsider the recent raising of its educational standards, which many people consider to be of doubtful benefit.

A complete education can never be obtained exclusively within a university. Educational establishments are intended to teach people to think in an ordered manner and to show the students how and where to obtain information. Once a certain standard has been reached, it is a fairly simple matter to educate oneself. We believe that the original standards set by the I.E.E. were quite sufficient and any further specialist knowledge required for the efficient discharge of his duties would readily be sought by the man concerned without having to assimilate a great deal of what would more than likely be quite useless information. As scientific knowledge increases, more specialisation will be necessary, yet the I.E.E. may continue to raise its standards. Increased specialisation will necessitate courses of a more general nature so that, when the engineer has to specialise, he will be able to

do so with a clearer understanding of fundamental principles and be able to relate his special branch with other areas of electrical science.

DOMESTIC APPLIANCE STATISTICS

At last it is becoming possible to measure with reasonable accuracy the output of domestic electrical appliances. The information previously published by the Board of Trade and the record of sales by the Area Boards gave only an incomplete picture, though sufficient to indicate the strong upward trend during the past twelve months. The merit of the figures which the B.E.A.M.A. are now collecting is that they cover almost the whole range of appliances; and the firms who participate in the scheme obtain information that is even more detailed than that now released for publication (see page 102). The B.E.A.M.A. have been successful in persuading all but a few manufacturers to supply details of their deliveries and it would be unfortunate if any firm should in future jeopardise the scheme by withholding its support. The only gap at present appears to be electric kettles. However, it would be useful if the published figure for space heaters could be subdivided into radiant and convector types, and if a total including parts and other appliances not listed separately could be added.

The figures for the third quarter show that the striking advances recorded during the first half of the year were maintained and confirm forecasts that 1959 will prove to have been a record year. Where figures have not previously been available, as, for example, for spin dryers, it will be some months before any trends are discernible. But the present figures emphasise the discrepancy between the rise in home sales and export performance.

BILLIONS

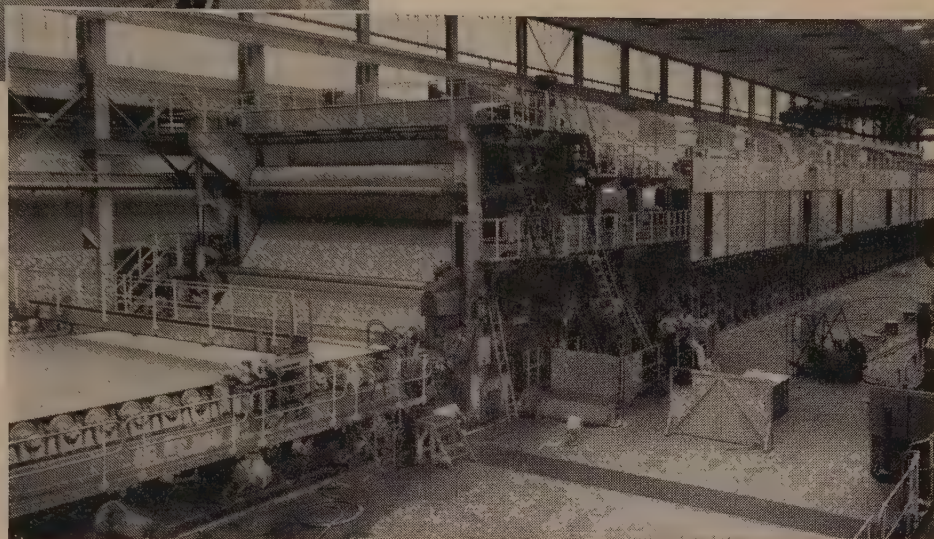
Considerable confusion is caused by conflicting national interpretations of the quantitative meaning of the term "billion." In America and France, it is used to indicate a thousand million (10^9) while in other countries it means a million million (10^{12}). Although the word was seldom required in the past, it is now coming into more common use because of the enormous growth of quantities in all fields of activity; for example, civil engineering projects requiring billions of cubic yards of concrete, and the annual consumption of electricity. The situation is complicated further by the occasional introduction of the "milliard" — one thousand million.

In nuclear physics, quantities in terms of billions are commonplace. Particle accelerators which impart energies of the order of tens of thousands of millions of electron volts are now in the course of construction. A 7,000 MeV particle accelerator, which in this country would be referred to as 7 GeV (giga or thousand million), is rated at 7 BeV (billion) in the U.S.A. Hence, the circular proton accelerator at the University of California has been called a "Bevatron" while a similar type of machine being built at Harwell is referred to simply as a proton synchrotron. These differences have been discussed internationally and it is hoped that the Americans will adopt "giga" in preference to billion, at least in the nuclear energy field.

We ask readers to assist us by completing and returning the questionnaire which will be found facing page 118. The purpose is to enable us to analyse our readership and provide an opportunity for those in different sections of the industry to indicate their particular interests

FROM LOGS TO NEWSPRINT

**£15 MILLION
EXTENSION AT
THE MERSEY DIVISION
OF THE BOWATER
ORGANISATION**



A log yard and the installation of a grinder house, a preparation plant and two paper machines have recently been completed at Ellesmere Port. This extension is capable of producing over 500 tons of paper per day. To provide the necessary power, a new boiler plant with a total rating of 270 klb/hr and a 15 MW pass-out turbo-alternator have also been installed

IN 1955, work began on an extension to double the output of the Mersey Division of Bowaters United Kingdom Pulp & Paper Mills, Ltd., at Ellesmere Port, Cheshire. This new extension, which is capable of producing over 500 tons of paper per day, has recently been completed at a total cost of £14 million and includes the second largest wood grinding plant in the British Isles, exceeded only by that at the same company's Kemsley Division. The grinding machines are used to reduce home-grown spruce and pine to wood pulp which is then passed to the paper machines after addition of imported chemically-made pulp.

The strength of paper depends on the strength of individual vegetable fibres and the quality of the paper on the type of fibre of which it is composed. The fibres used in the manufacture of newsprint are wood and the new machines use a mixture of mechanically ground and chemically digested wood fibres. To produce paper, the "stock" is made to flow on to the wire gauze belt of the paper machines. Water is extracted through the wire by drainage and vacuum until the fibres become sufficiently self-supporting to be transferred to a series of felts which carry the paper through the press and steam heated dryers. A calender gives a preliminary finish to the paper before it is reeled and transferred to a super calender for

the high polish needed on modern newsprint. The paper is then wound into reels of diameters and widths required by the printing presses.

The Kraft paper output from one of the existing machines is sent to two other factories on the same site for conversion into multi-wall sacks and corrugated containers. This fibre container factory has also been completed recently for Bowater-Eburite, Ltd., at a total cost of £1½ million. The factory contains a Langston-Masson double corrugator (see *Electrical Review* of 14th February, 1958) for the production of the fibreboard and a line of various machines for printing, slotting and stitching the boxes. A pitch fibre pipe factory, which will use waste paper, is also being built on the same site.

Wood pulp is produced either by mechanical grinding or chemical digestion. Mechanical fibres are shorter, but are more cheaply produced than the chemical fibres. Newsprint in this country is usually composed of 83 per cent mechanical pulp mixed with 17 per cent of chemical pulp to give it satisfactory strength. The new Mersey Mill extension includes a log yard and wood grinding plant for the production of mechanical wood pulp.

Log Yard

The log yard system is similar to that used in power stations for coal storage. In this case, logs 48in long are delivered by road or rail and are mechanically loaded on to the first of a series of conveyors. From this point, the wood can either be stacked in piles by a travelling

Title pictures show, top left: Log yard, showing unloading bay and the travelling stacker. Bottom right: No. 5 paper machine. The wire part is in the foreground, the press section in the centre and the steam drying part in the background

jib conveyor or it can be fed direct to the ground-wood mill. The stacker travels on rails between the storage piles and the cantilevered jib conveyor carries the logs to a height of 70ft. At present, the capacity of the storage area is 20,000 air dry tons of wood in three piles.

Logs are recovered from the pile by grabbing cranes and dumped into a recovery conveyor which discharges into the main conveyor system. Logs, either direct from the delivery area or from the recovery conveyor system, are conveyed to the barking drum 12½ft in diameter and 45ft long mounted horizontally. This open-ended barking drum is driven by a 150 h.p., 960 r.p.m. English Electric slip-ring motor at 6 r.p.m. Logs are fed into one end of the drum and pass out from the other, the bark having been removed by the friction between logs and between logs and the ribs of the drum. The debarked logs are then conveyed to the top of the loading floor of the nearby grinder house.

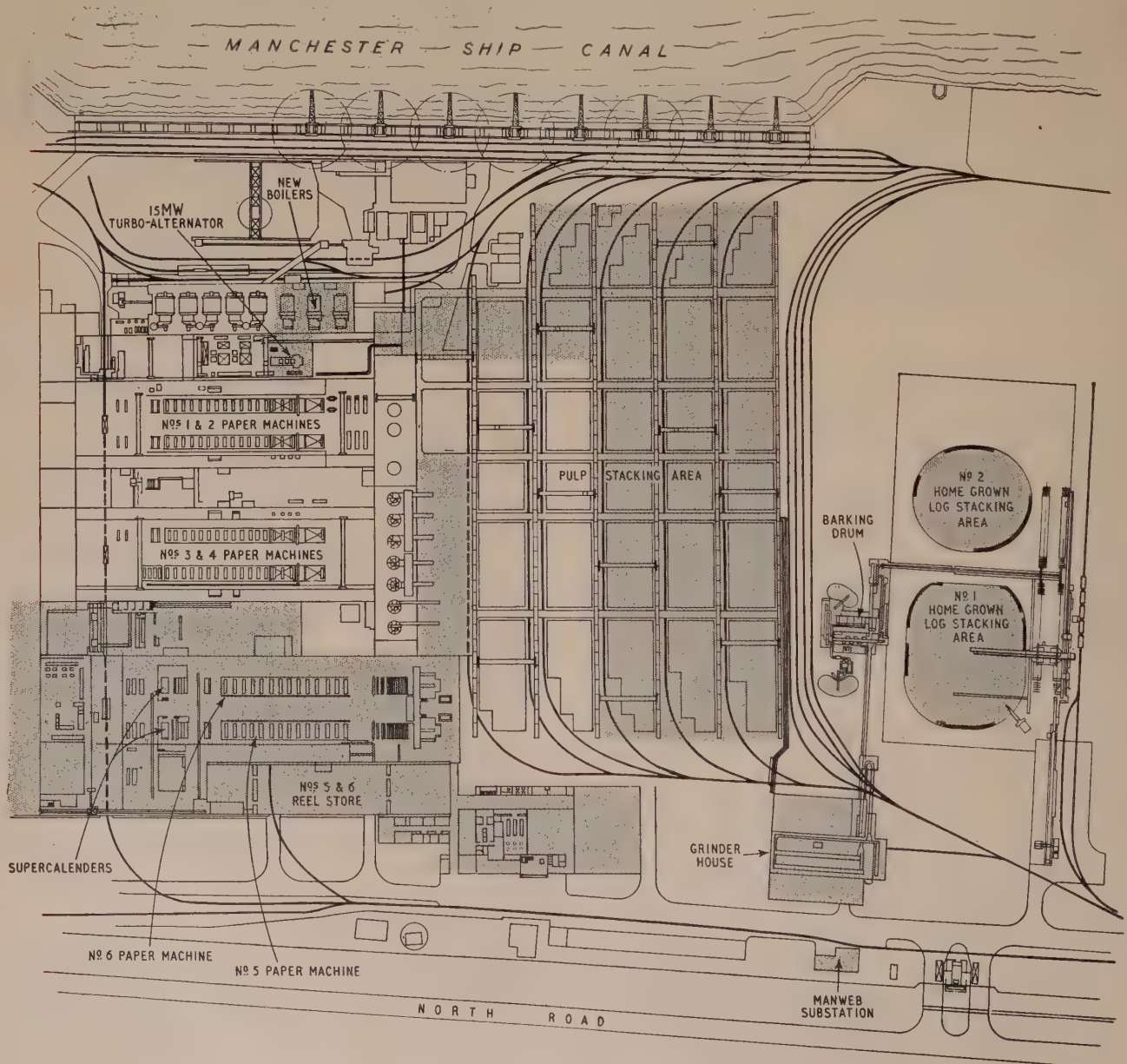
A 2 MVA, 3,300/440 V Johnson & Phillips transformer is housed in a substation in the wood yard to provide the 440 V supply for the log handling equipment. The wiring for the conveyor motors is p.v.c. sheathed

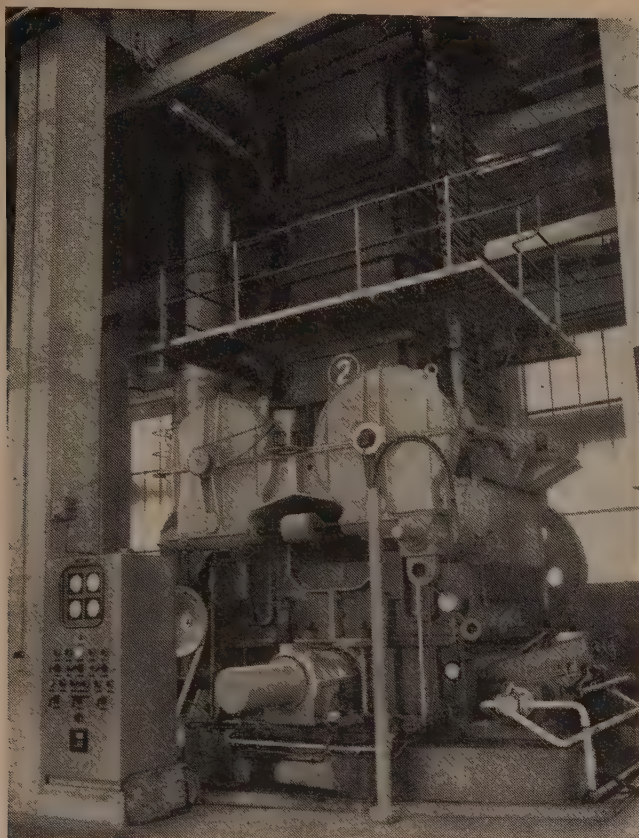
mineral insulated copper covered Pyrotenax cables and the Belmos control gear for part of the conveyor system is housed in the wood yard substation. All conveyors and the barking drums are sequenced by means of Dalry centrifugal switches on the respective motors. Lighting for the log handling area is provided by three 100ft high towers with a total Simplex floodlighting load of 100 kW.

Grinder House

The grinder house contains four Voith continuous wood grinding machines, each with a grindstone driven by a 4,000 h.p., 750 r.p.m. A.E.I. synchronous induction motor driving through 750/290 r.p.m. reduction gears. The grinders are vertical square canisters into which the logs are automatically fed, horizontally gripped by heavy feed chains and forced down on the rotating grindstones, 72in diameter and 54in wide, composed of cemented sections of carborundum. The grindstone is deluged with water and the resulting mixture of wood pulp and water is taken away to the coarse screens. If the water supply to the grindstones is cut off, a water pressure protection device immediately stops the machine to

Site plan showing the new extension





One of the grinding machines. The logs to be ground are fed down the canisters at the top of the machine by chains. The return sides of the chains can be seen at the sides of the canisters

prevent fire. The feed chains, which apply the load by pushing the logs on to the grindstone, are driven by 20 h.p. A.E.I. d.c. feed motors, each of which has its own Ward-Leonard set. The load on the grindstone is controlled by the speed of the feed motors which are, in turn, controlled by a closed loop magnetic amplifier system, the power signal being derived from an in-phase component bridge in the main motor instrument circuitry.

Starting and stopping of the grinder motors is normally carried out from control desks placed beside each motor, which are housed in a separate motor room, while load control is from an operator's panel in the grinder room. Starting equipment for the majority of the 440 V motors throughout the mill is grouped in Belmos or Printing & Paper Drives multi-motor starting switchboards with local or remote control. The internal log conveyor system in the grinder house is controlled from a desk on the conveyor floor at the top of the building and, with the aid of a mimic diagram, route sequence can be set. Instruments were supplied by the Record Electrical Co., Ltd. The total installed h.p. of motors in the grinder house and wood yard is 19,973 h.p.

The stock from the coarse screens is pumped to rotary screens and dewatered to about 3 per cent solid consistency and stored in continuously agitated chests ready for pumping to the adjacent paper mill.

Preparation Plant

Baled chemical and mechanical pulp is prepared for the paper machine by means of five new 20ft diameter "hydrapulpers," baled mechanical pulp being used in case of shortage of pulp from the groundwood mill. At this stage, the two different types of pulp are kept separate in different hydrapulpers. The hydrapulpers consist of

a circular tank with a dished bottom into which is built a heavy horizontal impeller, driven by a 375 h.p. Crompton Parkinson s.r. motor. Apart from loading, the hydrapulpers are remote controlled and the process is semi-automatic on a time cycle system. The output of the hydrapulper is pumped to one of the four dump chests.

From the dump chests, the stock is pumped to six Walmsley/Jordan size 5A refiners, each driven by a 400 h.p. Crompton Parkinson auto-synchronous motor. Two refiners operate on chemical pulp and the other four operate in parallel on mechanical pulp. The main duty of the refiner is to clear the beaten stock of clusters of fibres to make a uniform consistency. The refiner consists of a cone-shaped case with internal blades and a conical rotor with external blades. The degree of refining is controlled by the relative position of the case and the rotor and is regulated by transversing gear.

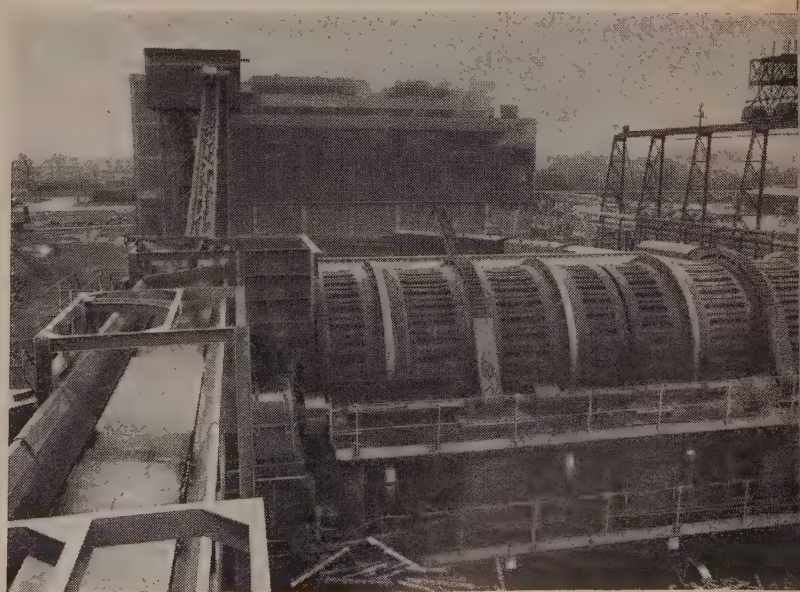
From the refiner chests, the two types of stock are pumped separately to the proportioner where they are metered to suit the recipe of the paper. The proportioner consists of a number of variable-speed bucket paddles and the quantity of each constituent passed to the mixed stock chest is directly proportional to the speed of the buckets. To ensure a uniform mixture, each constituent must have the same solid-to-water consistency before being passed to the proportioner.

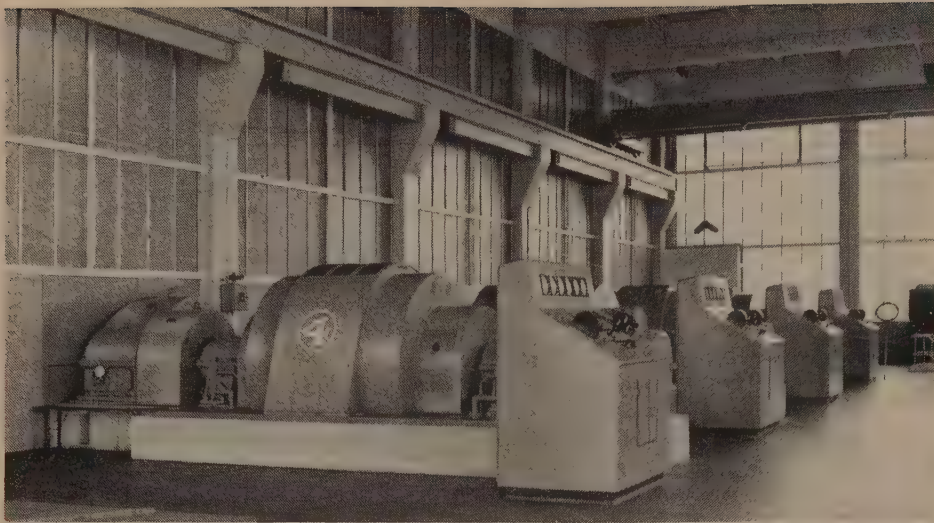
The mixed stock is then pumped to each paper machine line via two further refiners to a chest after which its consistency is regulated. It then passes to the wire pit from which the mixing pump draws stock and, after a further addition of water to give a solid consistency of one part in 160, the mixing pumps raise the stock to six rotary Bird screens per machine to remove any traces of undesirable material. This stock now falls by gravity to the slice pump which passes it to the pressure type flow box of the paper machine. Each pump is driven by an A.E.I. type CFT commutator motor of 250/190 h.p., 550/400 r.p.m.

Paper Machines

Two new paper machines have been installed, each designed for a paper speed of 2,000ft/min. The No. 5 machine was commissioned in June, 1958, and No. 6 machine was put into operation in October, 1959. At present, both machines are working on a 132 hr week.

The barking drum with the grinder house in the background





The 4,000 h.p. grinder motors. The shafting extends through the wall (left) to drive the grinders

The purpose of the flow box is to project the stock evenly on to a moving bronze wire gauze belt, which is the first and forming part of the paper machine. The desired weight of sheet, consistent with the speed at which the machine is operating, is determined by the rate of flow of the stock. As the speed of the machine increases, the rate of flow is increased proportionately and is controlled by the regulation of air pressure in the top half of the flow box, above the stock.

The bronze wire gauze belt is 294in wide and the wire part of the paper machine is 48ft 6in long with a fall, from one end to the other, of 12in. Water drains away from stock through the wire mesh during its travel through this section, leaving a mat of fibres. Water removal is assisted by passing the wire drainage surface over vacuum boxes. Finally, the wire passes over a 44½in vacuum couch roll, driven with the forward wire roll by a 750 h.p. motor.

At the end of the wire, the sheet of paper is fully formed and the remaining water is removed, first, by pressing and, secondly, by steam drying. At the couch roll, the

sheet is picked up from the wire by a suction pick-up roll running inside a wooden felt on to which the sheet is transferred and passed to two suction presses supported on a common felt. At this stage, it is passed under its own weight to a third suction press after which the moisture content is about 62 per cent.

The water absorbed by the pick-up felt is removed by passing the felt through a suction wringer press driven by a 150 h.p. motor. Each of the three main presses is constructed from rubber-covered bronze shells, each 44½in in diameter, driven by a 300 h.p. motor. These shells are drilled and vacuum boxes are

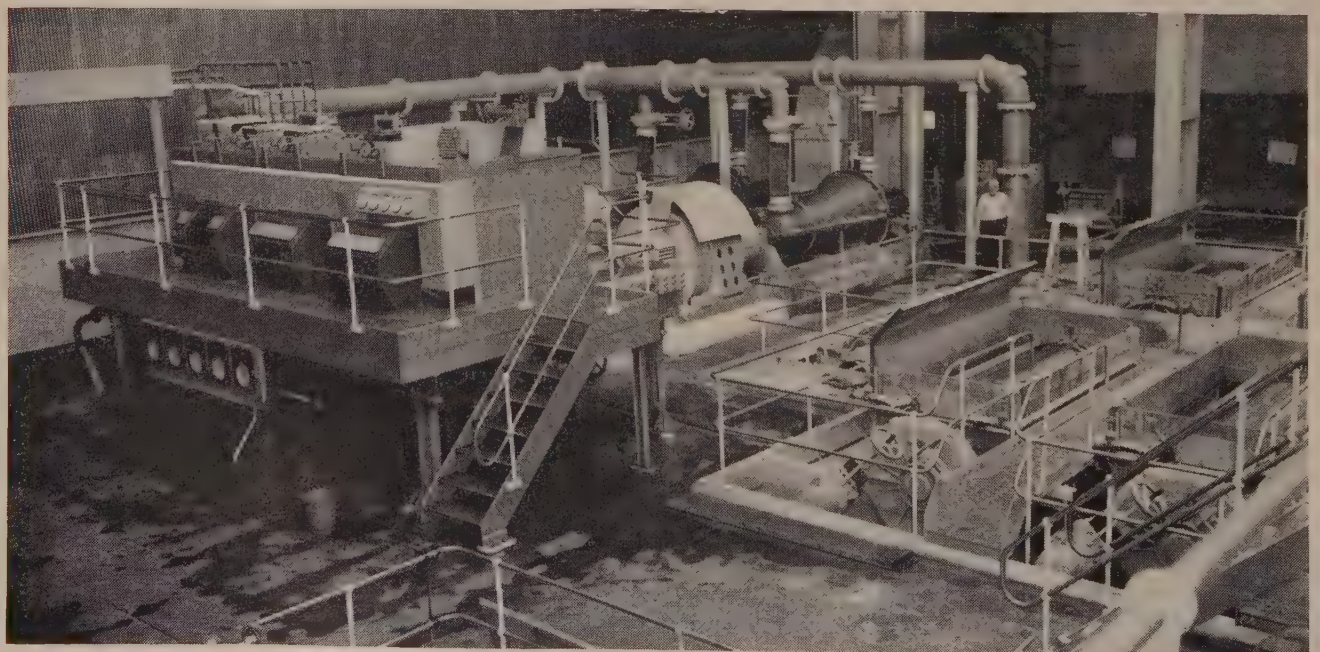
fitted in the rolls. The three top rolls were turned from solid granite bodies and are each 40in in diameter, weighing 22 tons, and the first press top roll is driven by a 50 h.p. motor; the other two have no motor drive.

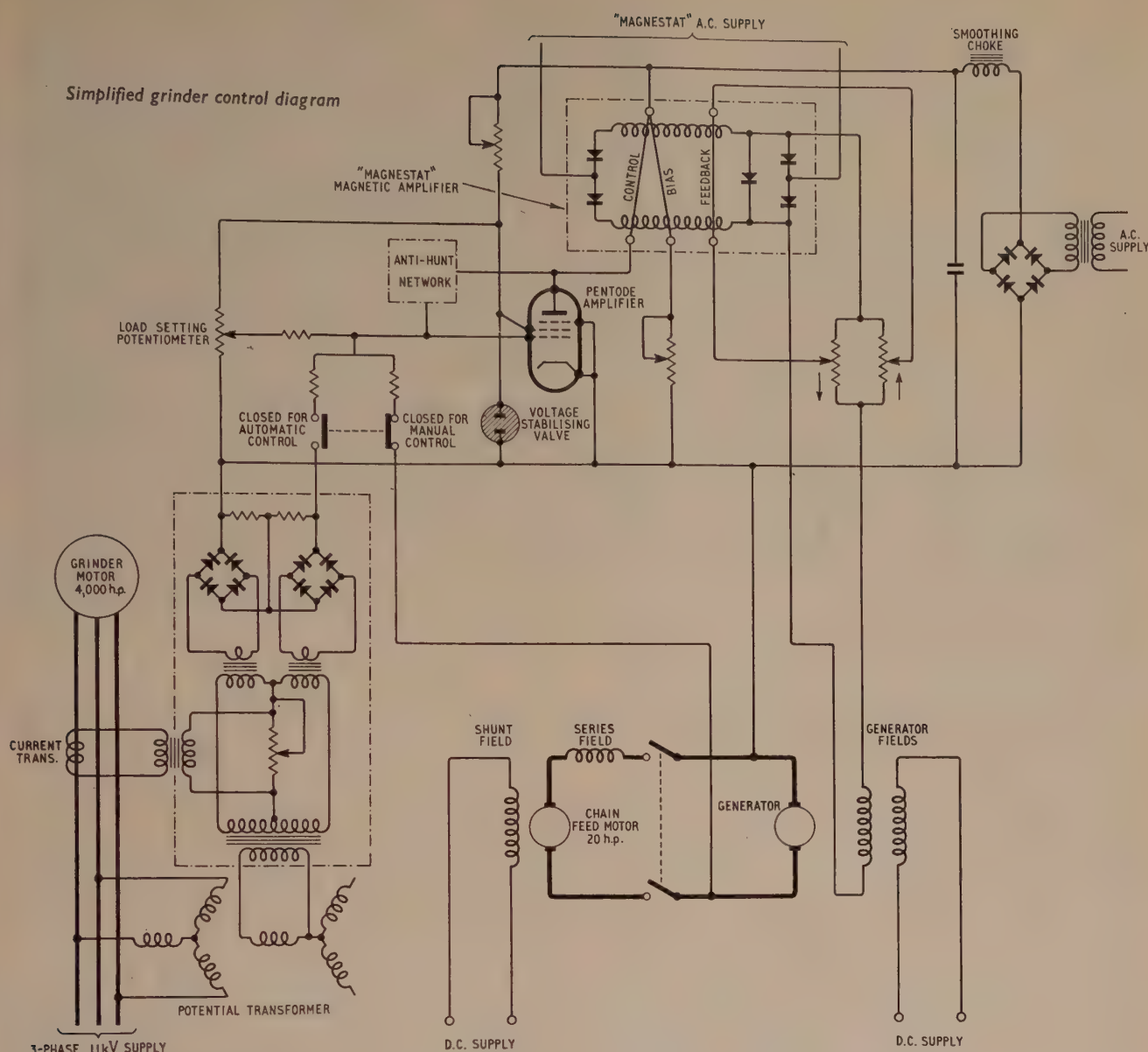
The vacuum under the wire and in the various suction rolls of the press part is provided by two four-stage rotary Sulzer turbo-blowers operating at 6,320 r.p.m. and each driven by a 1,400 h.p. A.E.I. s.r. motor through gearing. The blowers exhaust air at a temperature of 375°F and this is used to condition the felts in the dry part of the machine.

A control room has been built in the form of a bridge spanning the operating aisle between Nos. 5 and 6 paper machines at the wet end. This bridge contains all starting and running controls for the flow box, stock and water pumps and chests for both paper machines.

The paper leaving the presses is carried through a further series of felts where the paper is dried over 56 steam heated drying cylinders. These cylinders are 60in in diameter, 286in long, and steam is supplied at 25 p.s.i. The cylinders are in three sections, the second

The proportioner (centre) and rotary screens (right)





and third being geared together, and each section is driven by a 550 h.p. geared motor.

After the dryers, the sheet is passed through the machine calender to impart a primary finish. The calender, which consists of five chilled iron rolls between which the sheet is passed, is driven through the 40in bottom roll by a 550 h.p. motor. The sheet is finally wound on reel shells up to a maximum diameter of 88in, at which size the paper roll weighs 18 tons with a moisture content of 8 per cent.

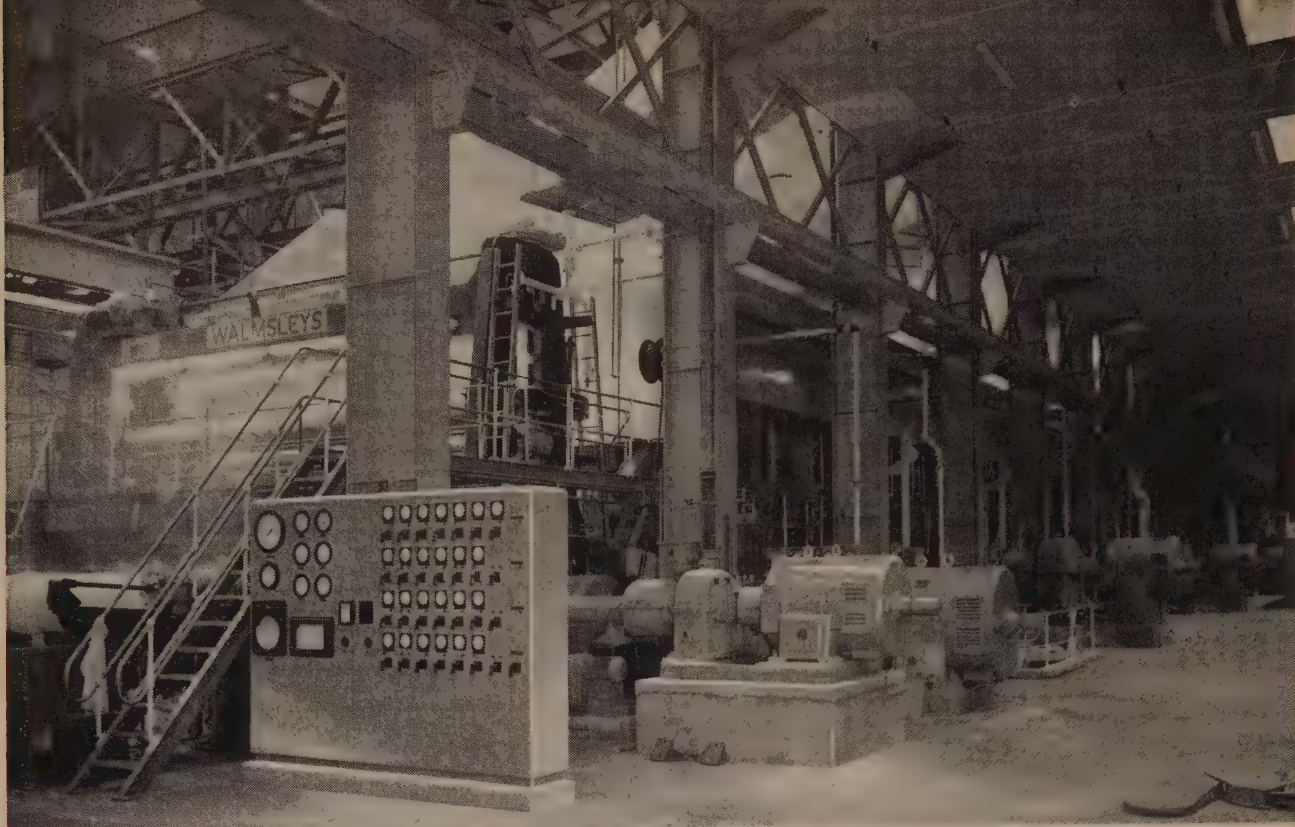
Paper Machine Drives

The driving power for the paper machine is supplied at various points along the machine. Some of the rollers are individually motored while others are grouped and mechanically coupled together from a single drive motor. There is no mechanical connection between any of the groups so that small variations in speed between adjacent sections could cause the paper to break. A slight stretching of the sheet (or draw) is, however, required and must be readily adjustable. The paper machine drives must therefore have accurate and relative speed control devices.

The A.E.I. paper machine drive motors are supplied from multi-generator Ward-Leonard systems. Each speed-controlled section of the paper machine is provided

with high accuracy d.c. tachometers. The tachometer voltage is matched against a proportion of a stabilised d.c. reference supply and any voltage difference is fed into a d.c. amplifier. In the case of No. 5 machine, the amplifier output controls a thyatron feeding the section generator field. With regard to No. 6 machine, the generator fields are fed from magnetic amplifiers. The machine speed as a whole is determined by the proportion of the main reference voltage fed to the control unit and the "draw" by minor alteration of this applied reference voltage at each section by means of "draw" rheostats. A low reference voltage is used for crawling the machine. To ensure that all sections accelerate at the same speed during normal operation, the rate of rise of the reference voltage is controlled by resistance capacity circuits. The two m.g. sets of each machine are driven by 1,500 h.p. and 1,700 h.p. synchronous machines for Nos. 5 and 6 respectively.

The usual protection devices for the electrical apparatus are included. Photo-electric cells have also been installed in various positions throughout the length of each paper machine to detect any break in the sheet, since a breakage of the paper at the normal working speed of the machine could cause considerable inconvenience if immediate action was not taken. If a breakage occurs, the photo-



No. 5 paper machine from the dry end showing some of the drive motors which were all supplied by A.E.I.

cells operate a water jet which removes the incoming stock from the wire part of the machine and returns the stock to the chest. The paper is therefore cut off immediately without having to slow down or stop the machine.

The paper from the machine reels is passed through a super calender to receive extra finish and uniform level (thickness) of about 0.0035 in. The super calender is designed for paper speeds of up to 3,300 ft/min so that, with its intermittent running, it can keep pace with the paper machine. It comprises a stack of nine rolls, four of which are chilled iron and five of woollen paper, which are driven through the 36 in bottom roll by a 750 h.p. A.E.I. motor. A 60 h.p. motor is provided for paper feeding and it also acts as a regenerative braking generator when running at speed. A 90 h.p. motor drives the reel drum on the wind-up side. Both the 90 and

60 h.p. machines are in parallel across a Ward-Leonard system and provide a controlled adjustable tension in the paper by means of amplidyne and boosters. The main drive motor can also be regeneratively braked.

From the super calender the reels are transferred to the winder or slitter on which they are cut and re-wound into the widths and diameters required. Regenerative braking and Ward-Leonard control are again employed in the A.E.I. drive. Auxiliary service motors in the paper mill, other than for the drives, have a total capacity amounting to 22,139 h.p.

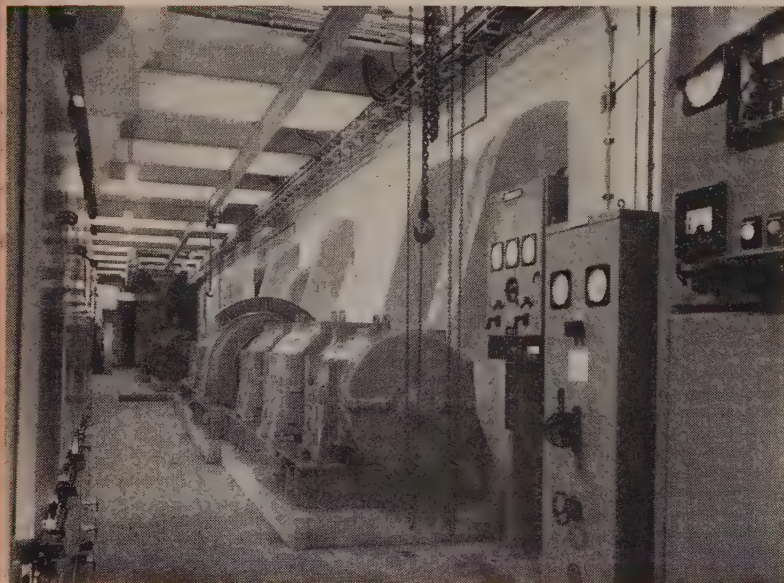
Power Supply

The total load of the plant in the new extension is about 43 MW at maximum demand. A new intake sub-station has been built and contains two 15 MVA, 33/6.6 kV transformers fed from the local Merseyside and North Wales Electricity Board network. These transformers feed an 11 kV, 500 MVA switchboard which supplies the Bowater-Eburite factories and the grinder house. A feeder from the grinder house is used to connect the M.A.N.W.E.B. supply to the power house reserve back busbars.

Additional power plant has been installed in the mill and comprises three Babcock & Wilcox spreader stoker-fired boilers, each rated at 90 klb/hr, 915 p.s.i. and 915°F, with a final feed temperature of 375°F. These boilers supply a 15 MW Parsons pass-out condensing turbo-alternator and process steam at 75 p.s.i. and 20 p.s.i.

Normally, the grinder house is fed from the M.A.N.W.E.B. supply and the paper mill from the mill power plant. The present maximum demand from the Board is about 14½ MW while 29 MW is supplied by the original 6 MW and 9 MW, 3.3 kV alternators and the new 15 MW alternator. However, to avoid a shut-down of one of the paper machines if one of the boilers in the mill power plant is out of commission, one paper machine is being supplied from the M.A.N.W.E.B. sub-station and one grinder machine is connected to the mill power plant. The loss of one grinder does not, therefore, reduce the paper output from the mill and baled

One of the No. 5 paper machine Ward-Leonard sets



mechanical pulp can be used from stock for make-up. The various synchronous motors in the plant provide good power factor correction.

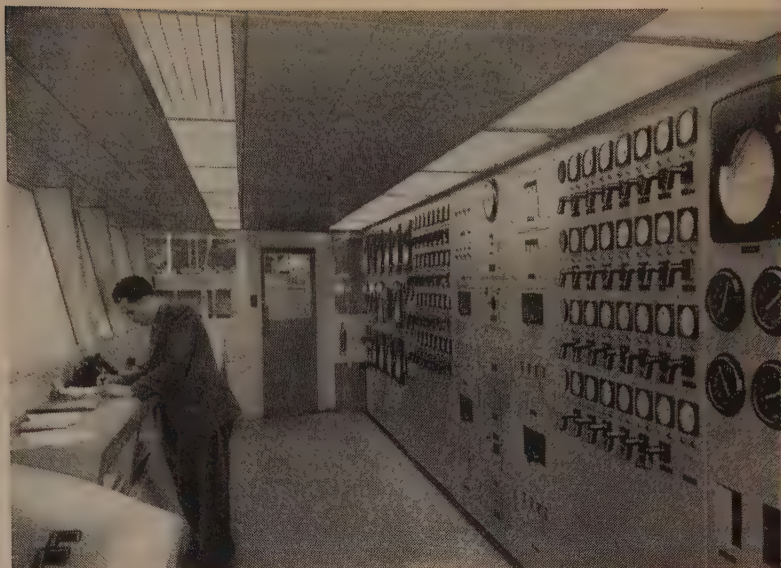
The new turbo-alternator consists of a two-cylinder impulse reaction turbine coupled to a 15 MW, 11 kV three-phase alternator running at 3,000 r.p.m. Steam conditions at the turbine stop valve are 900 p.s.i., 900°F, while the pass-out connections are at 75 and 25 p.s.i. Condensing plant has been designed to maintain 25.5 in Hg at 10 MW load.

Distribution System

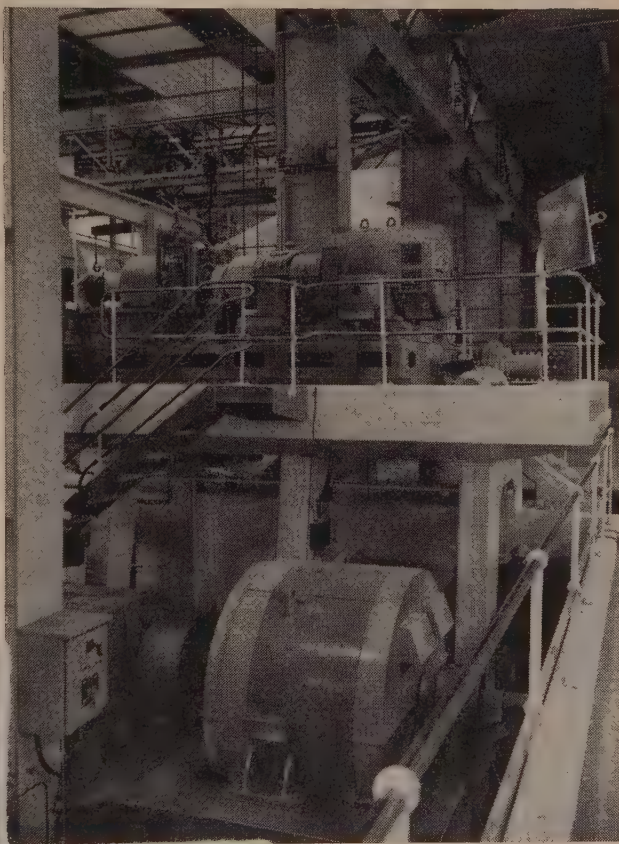
A 500 MVA, 11 kV Switchgear & Cowans switchboard has been installed and is fed by the new turbo-alternator. This board is connected via a 10 MVA Brush transformer with a new 3.3 kV Switchgear & Cowans switchboard which has replaced obsolete 3.3 kV switchgear. The M.A.N.W.E.B. supply is connected to the reserve busbar of the 11 kV switchboard via the grinder house and a further 10 MVA Brush transformer is used to interconnect this reserve busbar with the 3.3 kV system. A completely new control room has been provided for all the power station switchgear. The power supply for the Nos. 5 and 6 paper machines is fed at 11 kV from the power station to 500 MVA Switchgear & Cowans switchboards situated in the substations which contain the Ward-Leonard sets. A feeder from each paper machine switchboard supplies a 3.3 kV substation for the stock preparation and refining plant via Lindley Thompson and London Transformer Products transformers. These transformers, each 3.5 MVA, 11/3.3 kV, feed an 18-panel 3.3 kV, 100 MVA Ellison switchboard. The power required for each paper machine and its preparation plant is approximately 7 MW.

Power for the grinder house is normally obtained from the M.A.N.W.E.B. substation. An 11 kV, 500 MVA Switchgear & Cowans duplicate busbar switchboard situated in the grinder house supplies the 4,000 h.p. grinder motors at 11 kV and is also interconnected with the mill generating system. The 3.3 kV supply is provided by a 5 MVA, 11/3.3 kV London Transformer Products, Ltd., transformer which also supplies the transformer in the wood yard substation.

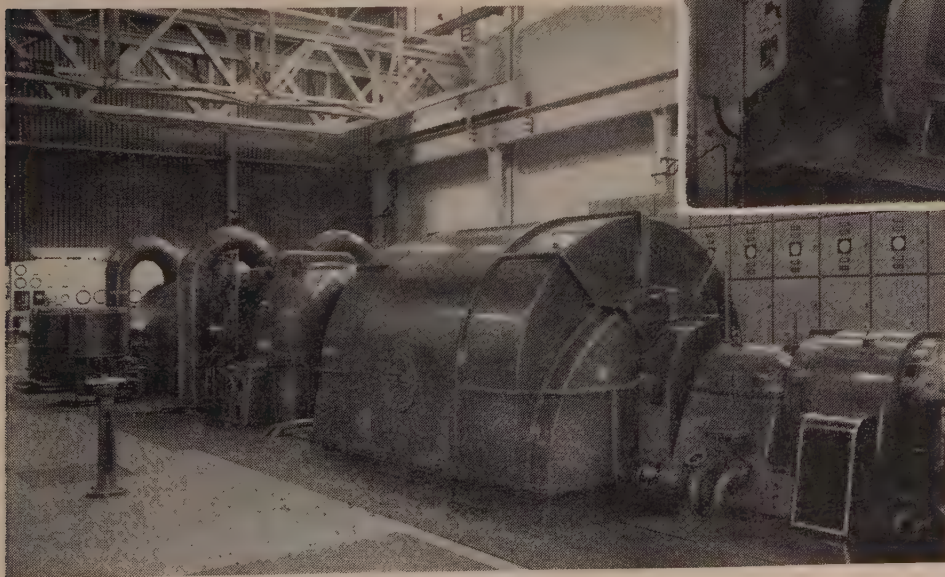
In general, all a.c. motors under 60 h.p. are wired in m.i.c.c. cable. Above 60 h.p., paper-insulated aluminium and p.v.c. sheathed cables have been used up to 0.2 sq in, while above 0.2 sq in paper-insulated lead-covered cables are used. All h.v. cables are p.i.l.c. s.w.a., with serving



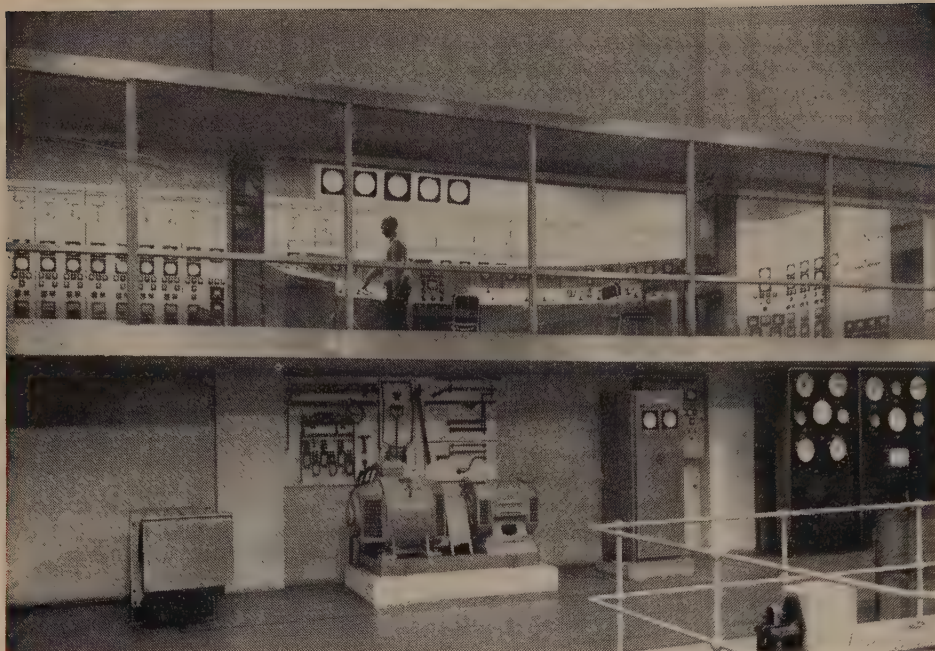
Inside the control bridge for Nos. 5 and 6 machines



Above: Super calender main 750 h.p. motor (foreground) and the 60 h.p. braking generator on the gallery



Left: New 15 MW Parsons turbo-alternator



New electrical control room in the power house

where applicable. The multi-core remote control cables are p.v.c. s.w.a. with p.v.c. sheaths. The bulk of the lighting installation has been carried out in m.i.c.c. cables. A spare for every different type of electrical machine, starter, etc., has been supplied.

responsible for the electrical installation of the paper machines and the 11 kV and 3.3 kV cabling in the power station; they were also sub-contractors to the Dalyte Electrical Co., Ltd., for the wood conveyor system electrical installation.

550 MW TURBO-GENERATOR

THE second 550 MW turbo-generator for installation in the Thorpe Marsh power station of the Central Electricity Generating Board is to be ordered from Associated Electrical Industries, Ltd. The total value of the contract will be £3½ million, and the unit is expected to operate with an overall station efficiency of about 40 per cent, which is 7 per cent better than that of Castle Donington, the most efficient station listed in the last annual report of the C.E.G.B.

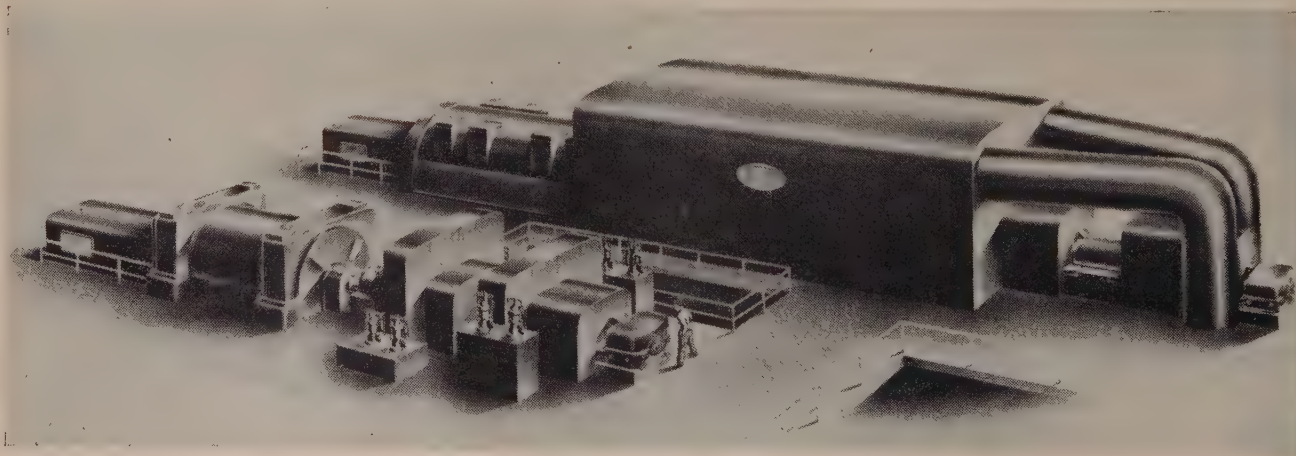
The turbo-generator will consist of a multi-cylinder steam turbine divided into two sections on two separate lines, each driving a 275 MW alternator. The two sections of the turbine will be cross-compounded with a single-flow h.p. cylinder and a double-flow first i.p.

cylinder on one line running at 3,000 r.p.m., and two single-flow second i.p. and two double-flow l.p. cylinders on the other line running at 1,500 r.p.m.

Steam at 2,300 p.s.i. and 1,050°F will be expanded through the h.p. cylinder and reheated to 1,050°F before expansion through the first i.p. cylinder. After leaving the high-speed line, the steam will pass over to twin second i.p. cylinders on the low-speed line, and thence to the l.p. cylinders, before exhausting to the condensers.

The two generators, although of equal output, will differ in size because one will run at 3,000 r.p.m. and the other at 1,500 r.p.m., but both will have water-cooled stator windings. The remaining parts of the generators will be cooled by hydrogen at 30 p.s.i.

Artist's impression of the 550 MW A.E.I. turbo-generator for Thorpe Marsh power station



Electrical Services in Housing

I.E.E.'S REPLIES TO MINISTRY'S QUESTIONS

SOME developments and trends in electrical services and equipment in future housing are outlined in the replies given by the I.E.E. Panel on Adequate Wiring for Electrical Installations in Buildings to a questionnaire issued by the Housing Standards Sub-Committee of the Central Housing Advisory Committee of the Ministry of Housing and Local Government.* The use of electric floor-warming systems, usually on an off-peak tariff, is rapidly increasing. These entail special fixed wiring installations having separate circuits, but if fitted during the construction of the dwelling, using electric heating cables in solid concrete floors, offer low capital cost and relative simplicity of installation compared with conventional heating systems. It is possible to achieve floor warming by circulating water (electrically heated or otherwise) in embedded pipes, but then space for a heat source, pumps, etc., has to be provided; with embedded wiring, external parts can be reduced to a minimum. Floor warming by embedded electric conductors is thus well suited to low-cost building. Practical advantages include the elimination of the need for fireplaces, chimneys and provision for fuel storage, which in small dwellings may provide as much as 25 sq ft additional floor space, and in multi-storey structures may lead to decisive capital economy. Heating in lower-cost dwellings is also being improved by the increasing use of electricity for other forms of background heating, e.g. electric convectors.

Except in the more expensive houses, the general trend is to confine permanently installed background heating systems to living rooms, halls and kitchens, although an increasing tendency for the floors of bathrooms and toilets to be heated is foreseen. Radiant heating appears to be preferred for bedrooms, and there is no evidence of any general demand for permanently-installed background heating systems in these rooms. The provision of adequate thermal insulation is a major factor in improving the efficiency and thus reducing the running costs of heating systems. The advantages of better insulation are beginning to be better known, but much remains to be done to make them generally recognised.

Effect on Layout

The use of electrical equipment may influence the interior layout of a dwelling. The increasing use of refrigeration is likely to make the provision of cool larders a matter of less importance, so that there will be greater freedom in the siting of the kitchen and it will not be necessary to take this factor into account if it is intended to vary the plan of the dwelling according to its aspect. Although the space provided by current design practice in houses and flats is generally reasonable, larger and better planned kitchens are required to ensure suitable floor and wall space for electrical appliances such as refrigerators, washing machines and spin dryers, for developments in existing appliances — e.g. horizontal electrical cookers—and for such new appliances as home freezers, dish-washing machines and garbage disposers.

Condensation in kitchens caused by flueless fuel-fired appliances is often a serious nuisance, leading to quick deterioration to decoration, but it can be abated quite

cheaply by the provision of an electric extractor fan. Little or no condensation is caused, however, when electricity is the source of heat for cooking and heating since it gives off no water vapour or other product of combustion. Moreover, electric laundering appliances avoid the need for boiling or for drying by evaporation and eliminate the problem of wash-day condensation.

Although it has been suggested, laundry facilities should not be provided in bathrooms. The Institution's Regulations for the Electrical Equipment of Buildings have for many years contained requirements that no provision should be made for the use of electric portable appliances in bathrooms, and that every means of electric control and adjustment should be out of reach of a person in contact with a bath. It would be impracticable to maintain these requirements and provide adequate laundry facilities unless substantial changes in the size and character of bathrooms are envisaged. Also, a considerable amount of space would be required for the use and storage of laundering appliances in the bathroom.

Socket-Outlets

In dealing with the desirable minimum scale of provision of socket-outlets, the Panel consider that a distinction between "lighting" and "power" points is undesirable and has long since been made unnecessary by the introduction of "all-in" tariffs. The ring-circuit system of wiring can provide at low cost adequate numbers of socket-outlets of a standard 13 A type. The rare adoption of the recommendations made in Post War Building Study No. 11—Electrical Installations, 1944, and in the Ministry of Health Housing Manual, 1949, was disappointing. The minimum number recommended then was three for living rooms, double bedrooms and kitchen, in addition to one for the cooker and refrigerator, water heater and laundering equipment. These should now be considered as the absolute minimum standard which might well be doubled. The number of socket-outlets recommended by the Panel as a desirable standard is six in the kitchen and utility room, if any, six in each living room, five in double bedrooms and three in single bedrooms. The number and diversity of electrical appliances coming within the reach of occupiers of low-cost dwellings are steadily increasing, as shown in the table,

Percentage "Saturation" of Appliances

Appliance	1946	1958
Hair Dryer	1.8	20.4
Kettle	18.9	30.3
Refrigerator	2.2	10.2
Toaster	4.2	12.2
Vacuum Cleaner	38.2	64.9
Washing Machine	2.0	28.4

The number of electrical appliances in use requiring connection to socket outlets is expressed as percentage saturation of the total number of dwellings.

and this must be considered in determining the number of socket-outlets to be provided in a dwelling which will remain occupied for at least thirty years. An adequate number also reduces danger by avoiding the need for adaptors and long trailing flexible cords.

Post-War Building Study No. 12 requires two lighting points in the kitchen and at least one in all other rooms,

* Replies to the questionnaire by the Federation of Registered House-Builders were reviewed in our issue of 25th September last (p. 322).

with provision for two-way switching in the hall and landing, and these recommendations are reaffirmed. The understair cupboard, loft and cellar, and back and front doors should all have lighting points. Switches controlling these points should be fixed 4ft 6in above floor level and at a distance not exceeding 9in from the architrave of the door opposite to the hinged side. The bathroom light switch may be wall-mounted if it is out of reach of a person in contact with a fixed bath.

The Panel point out that full compliance with the I.E.E. Regulations will ensure electrical safety, and that approved contractors on the Roll of the National Inspection Council for Electrical Installation Contracting are under engagement to give effect to these Regulations.

Domestic Appliance Production

THE B.E.A.M.A. have released the first set of figures which they have collected of manufacturers' deliveries of an almost complete range of domestic electrical appliances. The figures, which are set out below, are for the three months ended 30th September, 1959. For some appliances the

MANUFACTURERS' DELIVERIES OF DOMESTIC ELECTRICAL APPLIANCES

Appliance	Three months ended 30 September, 1959			
	Home Market		For Export	
	Quantity (000's)	Value (£000's)	Quantity (000's)	Value (£000's)
Blankets	399	969	2.4	6.1
Cookers, domestic types:				
(a) below 5 kW	29	338	2.0	16.7
(b) 5 to 12 kW	102	3,555	3.3	94.2
Dishwashers	2	169	0.3	13.2
Fans, desk and ceiling, below 1/10 h.p.	—	166	—	277.2
Floor polishers and scrubbers ...	5	67	14.1	126.2
Hand hair dryers	109	201	9.2	17.3
Irons (a) non-automatic	60	40	7.8	6.5
(b) automatic	496	862	138.9	206.1
Dry shavers	233	1,002	48.9	241.1
Space heaters up to 3 kW	692	2,270	18.9	63.4
Spin dryers	59	1,050	8.7	117.6
Heated tumbler dryers	6	169	0.2	4.5
Toasters	51	155	18.5	58.5
Food and drink mixers up to 3 quarts capacity including all hand held types	15	212	8.0	103.3
Vacuum cleaners	336	4,570	41.6	393.5
Washing machines with electric- ally driven agitators:				
(a) with hand or power wringers	174	6,607	19.6	462.9
(b) combined with a spin dryer	95	5,096	19.5	722.2
Water heaters:				
(a) immersion (up to 3 kW) ...	200	299	7.8	6.6
(b) storage (up to 30 galls) ...	38	394	3.9	56.4
Washboilers (up to 10 galls) ...	50	376	0.3	2.7

NOTE.—Figures for domestic electric refrigerators are not yet available for this quarter; they will be included in subsequent quarterly statements.

figures provide a continuation of those previously collected and published by the Board of Trade; for others, including spin and tumbler dryers, statistics are now available for the first time. Since all but a few manufacturers have participated in this scheme, which B.E.A.M.A. has organised on behalf of both its members and other firms, the figures can be taken as providing a reliable picture of the output of this section of the industry.

The next set of figures to be released will be for the fourth quarter of last year but from then on the figures may be issued monthly. Firms which participate in the scheme are provided with more detailed information.

Conductive Rubber Flooring

THE accumulation of static electricity is a serious hazard in certain situations, e.g. explosive works and hospital operating theatres, but the flooring can provide a safe discharge path to earth. Material for a variety of these special purposes is specified in the British Standard B.S. 3187,

"Electrically Conducting Rubber Flooring," which has just been published. Rubber can be made suitable for this type of flooring by the incorporation of materials such as carbon black, and volume resistivities down to $1 \Omega \text{ cm}$ can be obtained. An upper limit on the permitted electrical resistance is stated, 50,000 Ω , but no lower limit. Where this type of flooring is in use, all wiring and controls must be outside the zone of risk, and portable electrical equipment and flexible connections prohibited, to eliminate the possibility of electric shock or fire.

The factors necessary to make such electrically-conducting floors safe and durable—composition, workmanship, dimensions, resistance limits, hardness, etc.—are dealt with, and standard methods of test and sampling are given, together with the method of earthing. Sheets of rubber flooring which comply with the standard must be marked on the back with a continuous red line, the manufacturer's identification and the number of the standard. In some cases a rubber flooring is needed which is conductive enough to disperse static charges but sufficiently resistive to limit safely any leakage current from the electrical installation. This is properly called "anti-static" flooring and must have both upper and lower limits of resistance clearly defined; a further British Standard to cover these requirements is in preparation.

Copies of B.S. 3187 may be obtained from the British Standards Institution (Sales Branch), 2, Park Street, London, W.1, price 4s.

Automation and Computation

IN 1957 the British Conference on Automation and Computation was set up and organised in three groups of societies. Group A is concerned with the engineering applications of automation techniques, Group B with the development and application of computers, automatic controls and programming techniques and Group C with the sociological and economic aspects of automation and computation procedures. Group B was formally constituted on 20th December, 1957, with a number of societies and institutions as its members.

At the annual general meeting of Group B held on 17th December last the Executive Committee was reconstituted for 1960, while the secretariat of the Group continues to be provided by the Institution of Electrical Engineers.

The following is a revised list of the member organisations which, as from 1st January, constitute Group B:—Association of Certified and Corporate Accountants, British Computer Society, Chartered Institute of Secretaries, Institute of Actuaries, Institute of Bankers, Institute of Cost and Works Accountants, Institute of Fuel, Institute of Petroleum, Institute of Physics, Institution of Civil Engineers, Institution of Electrical Engineers, Institution of Production Engineers, Iron and Steel Institute, Office Management Association, Royal Aeronautical Society, Society of Instrument Technology and the Institution of Mechanical Engineers. Observer: Department of Scientific and Industrial Research.

One substantial activity which the Group has undertaken, in collaboration with Group A, is the sponsoring of the British contribution to the first Congress of the International Federation of Automatic Control (I.F.A.C.) which is being held in Moscow from 27th June to 6th July next. As the number of papers submitted by British authors exceeded the time and space allocated by the organisers of this Congress, arrangements are being made also for a British Convention on this subject to be held in London in September next, at which the surplus of suitable papers will be presented.

Further details concerning the I.F.A.C. Moscow Congress may be obtained from the Honorary Secretary, Group B, B.C.A.C., c/o the Institution of Electrical Engineers; the arrangements for the British Convention referred to above are in the hands of the hon. secretary, Group A, B.C.A.C., c/o the Institution of Mechanical Engineers, by whom further announcements will be made.

INDUCTION MOTOR LOSSES

By O. E. MAINER, M.Sc.Tech., A.M.I.E.E., and

J. R. EDWARDS, D.F.H., Graduate I.E.E.*

EXPERIMENTAL AND THEORETICAL

DETERMINATION OF ROTATIONAL IRON LOSSES OVER A WIDE RANGE OF SLIP FREQUENCY

IN the Scherbius system, large induction motors operate with roughly constant flux over wide speed ranges above and below synchronism. Polyphase commutator motors also operate over similar speed ranges and it was, therefore, considered that it would be instructive for students at the Royal Military College of Science to separate the iron losses in the manner described by Say¹ and compare the test curves so obtained with curves based on theoretical assumptions. Owing to the difficulty of separating the iron losses experimentally on the small machines available in the College laboratory, it was decided to assemble a rotor composed of unslotted circular mild steel plates $\frac{1}{4}$ in thick. The apparatus consisted of a three-phase stator with semi-closed slots of pitch 0.59 in and opening width $\frac{1.1}{64}$ in, in which was inserted a rotor consisting of cylindrical mild steel plates. The latter was coupled to the rotor of a d.c. shunt machine which had the field system swung on

Large induction motors using the Scherbius system and polyphase commutator motors operate over wide speed ranges and there are consequently good practical reasons for studying rotational iron losses. The theory of these losses is considered and curves based on theory and experiment are compared. Curves of surface drag losses are also discussed

bearings concentric with those of its rotor and constrained by two 10 lb spring balances at a radius of 1 ft. This machine served for both braking and driving the rotor, so that the latter could be run at any required speed in either direction.

The mechanical power supplied to or given out by the test rotor was calculated from the spring balance readings and the speed. The electrical power fed into the stator or returned to the supply at the stator terminals was measured by the two-wattmeter method.

Theory

The wattmeters measure the stator input power

$$P = P_{st} + P_g \quad (1)$$

where P_{st} is the power dissipated in the stator and P_g is the gap power.

P_{st} comprises stator iron and copper losses. For a given applied stator voltage very little variation in current takes place over a wide speed range and P_{st} can be regarded as constant.

The gap power P_g is divisible into the mechanical power, $P_m = (1 - s) P_g$, and the power dissipated in the rotor, $P_r = s P_g$ (where s is the fractional slip). At sub-synchronous speeds power is transferred from stator to rotor across the gap and, at super-synchronous speeds, from rotor to stator. To avoid confusion introduced by this change in the sign of P_g , it is advantageous to write for the power dissipated in the rotor $P_r = s P_g$. Then,

$$P = P_{st} + \frac{P_r}{s} \quad (2)$$

Making the usual assumptions, the iron loss can be divided into eddy current and hysteresis components, proportional respectively to the second and first powers of the slip frequency, so that

$$P_r = s^2 P_e + |s| P_h \quad (3)$$

In this equation, P_e and P_h are the standstill values of the eddy current and hysteresis losses respectively. To make the equation valid for both positive and negative slips, it is necessary to multiply P_h by the modulus of the slip. Substituting equation (3) in (2),

$$P = P_{st} + s P_e \pm P_h \quad (4)$$

(The + sign applies below synchronism and the - sign above synchronism.)

The three components of the wattmeter power are shown plotted against slip in Fig. 1, and the three components are combined in Fig. 2 to show the theoretical wattmeter

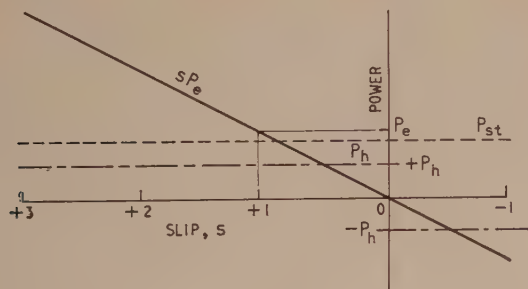


Fig. 1.—Components of wattmeter power

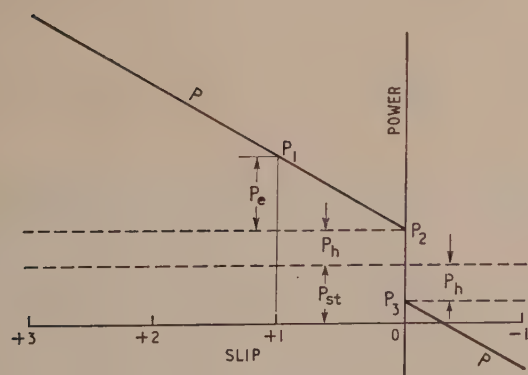


Fig. 2.—Wattmeter power at varying slip

* Both of the Royal Military College of Science, Shrivenham.

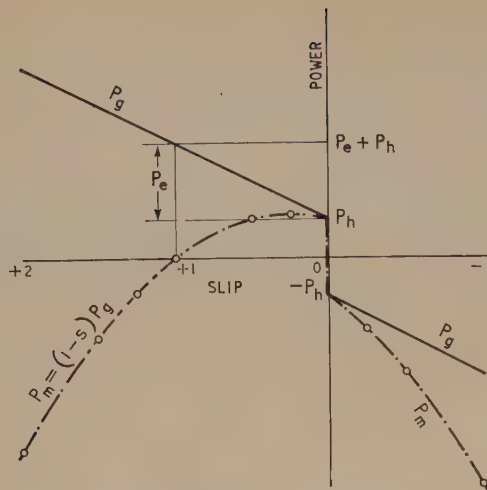


Fig. 3.—Mechanical and gap power

power. To separate the components in the wattmeter power, it is usual to use the following readings:—At standstill, $P_1 = P_{st} + P_h + P_e$, at a speed immediately below synchronism, $P_2 = P_{st} + P_h$, and at a speed immediately above synchronism, $P_3 = P_{st} - P_h$.

Therefore, $P_{st} = \frac{P_2 + P_3}{2}$, $P_h = \frac{P_2 - P_3}{2}$, $P_e = P_1 - P_2$.

The mechanical power transferred across the gap is $P_m = (1 - s) P_g$, where $P_g = \frac{P_r}{s} = s P_e \pm P_h$. Both gap

power and mechanical power are shown plotted in Fig. 3.

By taking at a given speed the difference in the power registered by the spring balances with the stator excited and then not excited, the friction and windage loss is eliminated and the mechanical input to the rotor from the d.c. motor is obtained. This may be designated P_d .

If there were no mechanical loss P_d would balance P_m and $P_d + P_m = 0$. However, owing to the slotting of the stator, variations take place in the rotor flux density at slot frequency (r.p.s. \times number of stator slots). This rapid change of flux density is largely confined to the surface skin of the rotor and, as the rotor is composed of thick plates, it is mainly a high frequency eddy current loss. It exerts a drag on the rotor similar to friction such that

$$P_d + P_m = P_s,$$

where P_s = surface drag loss.

In Fig. 4, the loss is shown plotted for the hypothetical case where $P_s = K n^{1.5}$, K being chosen to make $P_s = 2 P_h$ at synchronous speed (n = rotor speed in r.p.m.). The speed index chosen conforms with Gibbs' equation² for eddy current surface loss in plates and with the theoretical equations of a number of investigators listed by Aston and Rao.³

Experimental Results

The following precautions were taken in obtaining experimental results. To ensure stability of the stator supply a synchronous motor-alternator set was used, the motor being fed from the mains and the alternator field manually controlled to give a constant voltage three-phase output to the test motor.

Long cooling periods were allowed for the test rotor, during which time the stator supply was switched off, the rotor turned over slowly and air blown axially into the motor. It was found especially necessary at slips approaching $+3$ to start with a cold rotor for each set of readings and read all instruments very quickly.

A stroboscope synchronised to the mains supply was used

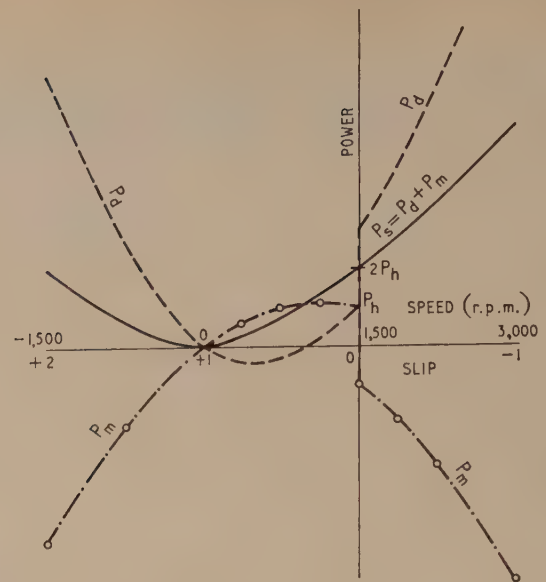


Fig. 4.—Surface loss

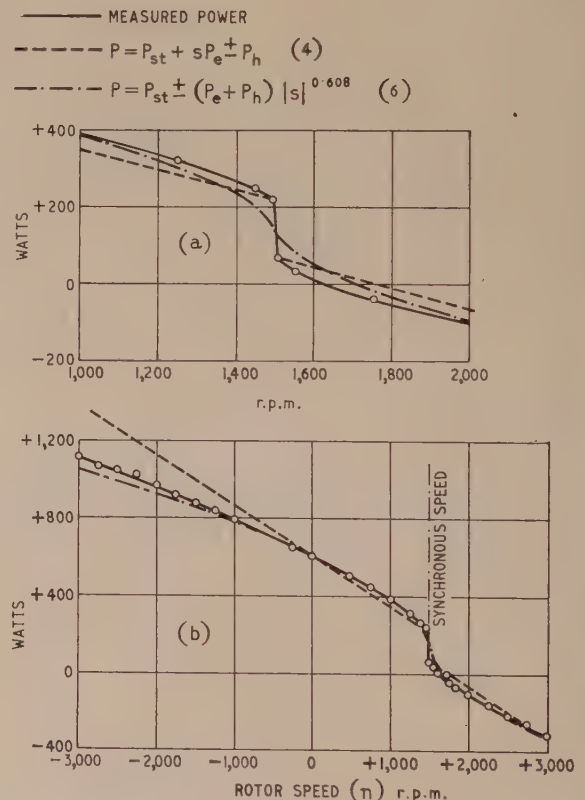


Fig. 5.—Measured and theoretical wattmeter powers. Fig. 5 (a) is an enlargement of the area around synchronism

to measure the exact slip near synchronism, since at this point a slight change of slip causes large variations in power readings.

In Fig. 5, the measured wattmeter power is compared with the theoretical power represented by equation (4). Because the theoretical equation uses measured values at standstill and synchronism, there is fair agreement over the useful range of slip between $+1$ and -1 . However, it is quite obvious that this theoretical treatment cannot be regarded as verified experimentally and it must be seriously

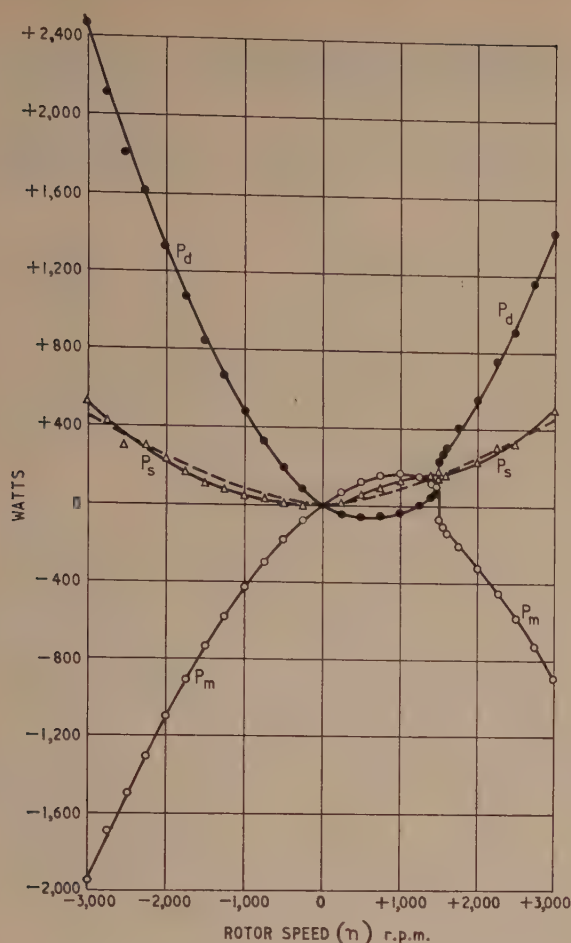


Fig. 6.—Rotor mechanical output, input and surface loss

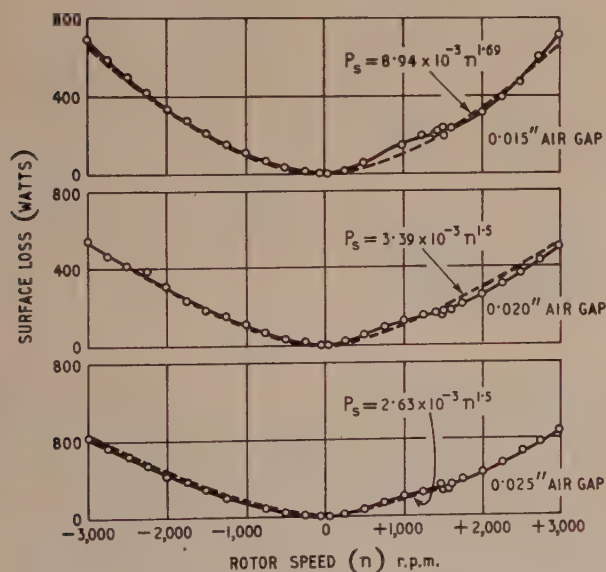


Fig. 7.—Surface loss with various air gaps

doubted whether rotational iron losses can be represented by equation (3).

The empirical formula

$$\text{Rotor iron loss} = (P_e + P_h) |s|^x \quad (5)$$

in which the index x is chosen to agree with the measured value of rotor iron loss at half-synchronous speed ($s = 0.5$), gives good agreement with the measured rotor iron loss over the slip range $+1$ to -1 except at speeds close to synchronism, where the rotor iron loss is too small to be

of any consequence. In this case, $x = 1.608$ and substituting formula (5) with this value of x in equation (2) gives,

$$P = P_{st} \pm (P_e + P_h) |s|^{0.608} \quad (6)$$

The empirical formula (6) has been plotted in Fig. 5 and clearly gives better agreement with the measured results than the theoretical equation (4) over the whole slip range except near synchronism.

Surface Drag Loss

The experimental results for P_d , P_s and P_m are shown in Fig. 6. The broken line curve represents an equation of the form $P_s = K n^{1.5}$, in which K has been chosen to agree with the experimental value of the surface drag loss at synchronous speed (1,500 r.p.m.). It is apparent that this theoretical curve cannot be regarded as giving good agreement with the experimental curve. Also the experimental curve contains a kink which is not understood.

To investigate further the surface loss, a rotor with $\frac{1}{2}$ in plates was assembled and the surface drag loss measured for different gap widths. The results are illustrated in Fig. 7. Expressing this loss in the form $P_s = K n^x$, it was found that the exponent x was 1.69 for the smallest gap and 1.5 for the larger gaps. The unexplained kink was present to a smaller degree as the gap width increased.

REFERENCES

- 1 Say, M. G. "The Performance and Design of Alternating Current Machines." (Pitman), Chapter XIV.
- 2 Gibbs, W. G. "Tooth-Ripple Losses in Unwound Pole-Shoes." *Journal I.E.E.* 1947, 94, Part II, p. 2.
- 3 Aston, K., and Rao, M. V. K. "Pole-Face Losses Due to Open Slots." *Journal I.E.E.* 1941, 88, Part II, p. 2238.

G.P.O. Apprenticeship Scheme

A SCHEME is being instituted this year by the General Post Office under which it will guarantee university training in electrical, electronic or mechanical engineering or a Diploma in Technology course at a College of Advanced Technology to about 20 suitable students from schools. University fees, college union dues and the costs of examination will be paid, in addition to half the cost of essential textbooks.

During the student apprenticeship, including the time of attendance at university or college, salaries will be paid according to age and varying from £260 per annum at 17 to £430 at 21 and over. Student apprentices will be selected from men of British nationality who are between the ages of 17 and 20 on 1st June in the year when apprenticeship starts. They must have obtained, or have good prospects of obtaining, a good G.C.E. at ordinary level and at least three subjects, including mathematics and physics, at the advanced level.

The apprentice will train within the Post Office for the first year, part of which will be spent in London and the remainder near the student's home. At intervals he will attend educational courses to revise earlier studies and to progress beyond the advanced level in appropriate subjects. Specialist subjects such as electro-technology, heat engines, etc., will be introduced. University or college studies will start in September/October of the year after apprenticeship begins. The student apprenticeship will last 4½ years, except in Scotland and Northern Ireland, where it will be slightly longer to allow for the duration of university courses.

The course has been designed to meet the requirements of the professional engineering institutions, which have been consulted in its preparation. The Post Office has produced an illustrated booklet which explains the scheme, the scope of work which Post Office engineers do and career prospects, and this is being sent to headmasters and careers masters of public and grammar schools.

VIEWS on the NEWS

By REFLECTOR

WHEN the electricity supply industry was nationalised the new authorities acquired with the former companies' systems a variety of assets and liabilities. The assets actually included the gas undertakings of five "composite" companies, as well as interests in property-owning companies, consulting engineers and a cooker manufacturing concern. These extraneous acquisitions were subsequently disposed of. Of the liabilities side not so much is known and it comes as a surprise to me to find that the Eastern Electricity Board still operates a charity which was instituted in 1838 and was inherited by the Board when it took over Finborough Hall, Stowmarket (formerly the property of the East Anglian Electric Supply Co.) as headquarters for its Suffolk Sub-Area. The Ipswich *Evening Star* reports that recently, under the terms of the charity, ten widows and a widower each received from the Board a glass of port wine, a mince pie and 23s. Originally, the beneficiaries were given cloaks, but now they have cash instead.

* * *

Reporting one of the South Eastern Electricity Board's staff conferences *Seaboard* says:—

"Nobody can say that Mid-Sussex employees are not electrically-minded when it comes to their own homes. A survey of a cross-section of ninety-seven of them at the conference showed that fifty-three had electric cookers, thirty-four refrigerators, fifty-seven water heaters, thirty-seven washing machines and seventy-two electric kettles."

It may be that not all of the ninety-seven were householders, but I do not think that this count is particularly good for an electrical community. I have always had the feeling that there is still a great deal of scope for electrical development within the industry and this confirms it. A suggestion was made at the conference that employees might be given reduced rates of electricity which they used at home, as an incentive, but I am glad to see that this was not approved by a panel which was answering questions. In another part of the magazine, however, it is noted that employees of Electricité de France enjoy special terms.

* * *

The alleged expensiveness of electricity in some applications can generally be traced to careless or extravagant use. It is a strange thing that many people who are most careful to switch lights off when they leave a room, although this matters very little, are apt to let larger appliances go on running. Apart from this there is a technique in, say, electric cooking by which much energy can be saved. The electricity supply authorities are generally aware of this and, realising that selling too much electricity in this way is not good business, give consumers hints and tips on correct use. Floor warming is coming to be increasingly adopted and care has to be taken that it is not unduly expensive. At Darlaston, Staffs., the Urban Council has decided to experiment with the heating of some of its new houses in this way and it

is taking the wise precaution of training residents in its use beforehand to avoid complaints of excessive cost. But the Council should also make sure that the tenants realise that they are getting good value for their money even where the bills seem to be high.

* * *

A suggestion by one of their leaders that miners should boycott public houses which employ oil for heating does not seem to have gone down well. The *Guardian* reports one Derbyshire miner as saying:—

"If they electrified the beer the men would still drink it, and they'd get it in the pub they've always gone to."

It would probably be coal-produced electricity anyhow, and so there could be no argument.

In the same connection the director of a firm making wooden boxes writes to *The Times* to "applaud" the idea. He asks for support for his industry in insisting upon legislation to prevent the further use of cardboard and fibre-board boxes. He says that his friends in the harness trade also seek help against the growing use of horseless carriages.

* * *

Referring to the "National Electricity Quiz" which has been organised by the National Union of Townswomen's Guilds, in collaboration with the Electricity Boards, *London Electricity* mentions the need for housewives and their families to have a wider knowledge of electricity and its applications in the home. I agree, but I cannot believe that there are "a number of (charming) women who are still capable of trying to light an electric cooker with a match." Even the "dumbest" of blondes must know about the electric cooker by this time whether she uses one or not.

* * *

An article in the *Electrical Review* of 15th January, 1880, described at some length Edison's new carbon-filament lamp. It also gave the inventor's views on the possibilities opened up by the lamp, including power stations with "engines of immense power which will drive several generating machines, each generating machine supplying about fifty lamps." Edison went on:

"The apparatus for measuring the amount of electricity used by each householder is a simple contrivance consisting of an electrolytic cell and a small coil of wire, appropriately arranged in a box, the latter being of about half the size of an ordinary gas meter, and like a gas meter it can be placed in any part of the house. The measurement is obtained by the deposit of copper particles on a little plate in the electrolytic cell, such deposit being caused by the electric current passing through the cell. At the end of any period, say one month, the plate is taken by the inspector to the central office, where the copper deposit is weighed, and the amount of electricity consumed determined by a simple calculation."

Lisbon Underground Railway

ALTHOUGH the building of an underground railway in Lisbon had been under consideration for many years, it was not until 1953 that the scheme was sanctioned by the authorities. In 1955, for the first stage of the 750 V d.c. Metropolitano de Lisbon Railway, the General Electric Co., Ltd., was awarded contracts covering the power supply, ventilating and pumping equipment and also the h.v. cabling from the Rotunda main substation and Rotunda traction substation. These contracts were obtained in the face of severe Continental competition and were the only ones placed with British manufacturers. The G.E.C. plant was commissioned in June, 1959, and the extent of the present and future underground systems is shown in the diagram.

All the main 3 kV and 10 kV switchgear, the high-speed track feeder circuit-breakers and the standby diesel alternator sets are remotely controlled from the main control room in the Rotunda main substation. Indicating lamps show circuit abnormalities and the state of switching.

Power is supplied from the national grid system at 10 kV, three-phase, 50 c/s through two feeders to a seven-panel 350 MVA solenoid-operated switchboard in the Rotunda main substation. Two 10 kV cables leave this board to terminate at an isolator board in the underground traction substation. The 11-panel, 3 kV, 50 MVA switchboard in the main substation is fed through a 10/3 kV, 1 MVA step-down transformer and controls the supply to the six power and lighting feeders serving the various 3 kV distribution points at the passenger stations. An 850 kVA, 3 kV diesel alternator set is installed to supply a limited amount of power to the system in the event of a 10 kV power failure, thus providing lighting at the various stations and sufficient power to enable trains to be moved to the nearest station.

The alternator is of the revolving field type and is driven by a Davey Paxman diesel engine. The engine is started under an automatic starting sequence and it can be synchronised or stopped from the main control board or from the local control panel. Provision is made for

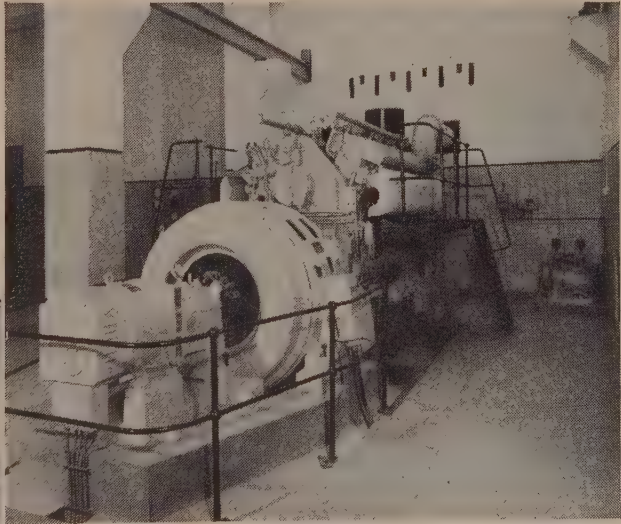


The Lisbon underground railway system

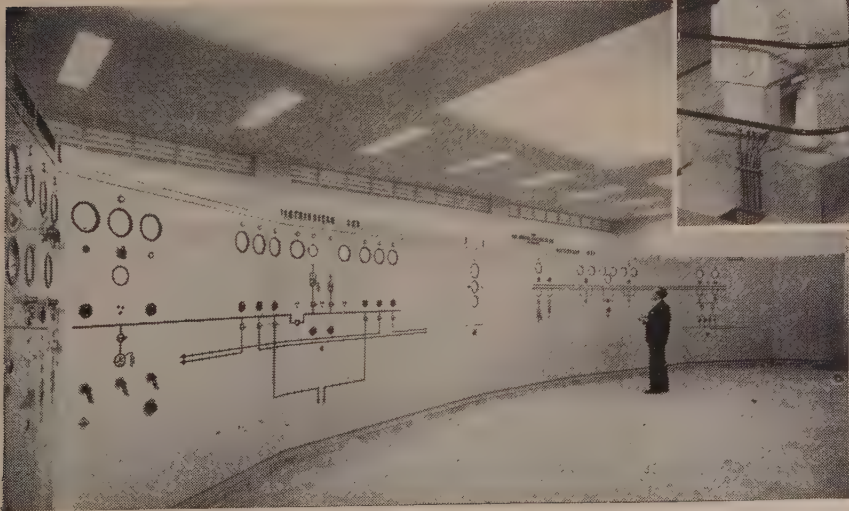
synchronising the diesel alternator on to the 3 kV board when it is required to run in parallel with the supply.

The low-voltage (380/220 V) supply at the main substation is provided by a three-cubicle switchboard. Each cubicle is fitted with an electrically-operated air circuit-breaker for the incoming supply which is provided by two 120 kVA transformers energised from the 10 kV and 3 kV boards respectively. A standby l.v. feeder from the city system also supplies this board, with interlocks to prevent the public supply being paralleled with the l.v. side of the transformers.

The traction substation, which is situated at the



Above: 850 kVA, 3 kV diesel alternator set



Left: G.E.C. remote control board in the rectifier main substation

Rotunda underground railway station, has two floor levels: the transformer floor at track level and above this the rectifier floor which also contains the 750 V d.c. high-speed track and rectifier circuit-breakers.

Each of the two 1,500 kV rectifier sets consists of two transformers, each having a six-phase output with inter-phase windings feeding a six-anode mercury-arc rectifier. The rectifier transformers are filled with Pyroclor and tertiary windings are provided to supply the rectifier auxiliaries.

The ventilation plant is in two parts: the main ventilation of the stations and tunnels and the independent

ventilation of the electrical substations. The main ventilation is obtained partly by forced draught fresh air and partly by air drawn in through the station entrances as a result of extraction from the tunnels. Thirteen pumping stations, with a total of 20 pumps, have also been supplied to extract water drained from the track stations and discharge it into sumps to prevent flooding. Pirelli-General Cable Works, Ltd., were responsible for the supply and installation of most of the cables used in the underground railway system. These included over 2,000 metres of 10 kV, three-core cable and 13,850 metres of 3 kV, three-core cable.

NEW JACKSON COOKERS

DETAILS of a new range of Jackson electric cookers were announced last week by the Electrical Division of Radiation, Ltd., 143, Sloane Street, London, W.1. The "Estate" cooker is a development of the company's previous Jackson "Joy" model and has been produced as a low-priced three-plate cooker for housing estates, bulk purchasing and similar markets. At a price of only £28, the standard model, 391P, has two fast boiling "Speedring" plates (one 8 in 2,000 W and one 6½ in 1,350 W) controlled by six-heat switches, and a 10½ by 8 in grill boiler (2,300 W). The large-sized oven (3,000 cu in) is heated by two 1,050 W side elements, and a plain plinth base is fitted. Model 391C has similar features but a storage cupboard is provided in the base with a drop-down door which discloses a wire-mesh tray for storing crockery, etc. The price of this model is £30. The third "Estate" cooker, the 391CT, has additionally an automatic timer mounted on the splashplate and chromium plated bezels round the boiling plates and grill boiler. The price is £35.

All these "Estate" models are finished in either all-cream or all-white vitreous enamel on the splashplate, hob and front with stove enamelled rust-proof steel side panels. They are 41½ in high to splashplate (47½ in high to top of timer, 391T) by 24½ in deep (25½ in deep to back of timer, 391T) by 20½ in wide.

The new "Highline" range is also available in three



Jackson "Estate" model 391C three-plate cooker

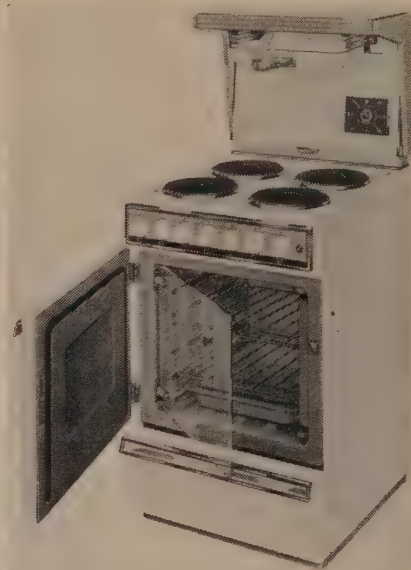
of the "Highline," is recessed in such a way that it retains any normal spillage, yet is so shaped to prevent ingress of spillage round the boiling plate openings. The "Speedring" plates fitted to these cookers are of standard Continental design and are 18 cm (7-in) in diameter. They

are held against the hob under tension, forming a seal with the hob pressings. On the model 493 cooker, three "Speedrings" are fitted, one of which is a V.H.S. (very high speed) plate with a loading of 2,400 W. The loading of the remaining two plates is 1,500 W each. All are controlled by six-heat switches. The oven (3,000 cu in) has two reversible rod racks and a vitreous enamelled oven pan. An inner glass door is also fitted. The total oven loading is 2,400 W.

At the base of the cooker there is an independently heated hotcupboard (500 W) with a drop-down door. This contains a wire basket for storing crockery, etc. The price of the model 493 is £45, and a similar three-plate model fitted with automatic oven control (493T) costs £51.

The four-plate "Highline" (model 494T) has three 1,500 W "Speedrings" and one V.H.S. plate (2,400 W); automatic oven control; and an interior oven light. This model is priced at £56. The finish of the "Highline" models is all-white with grey panels and yellow switch knobs or alternatively all-cream with grey panels and cream switch knobs. The handles are chromium plated.

The normal height of the "Highline" is 32½ in but, for those who prefer a higher model, a mobile plinth with castors and a brake is available, price £3 extra. Not only does this bring the hob height up to 36 in but it also allows the cooker to be moved easily for cleaning purposes.



Jackson "Highline" model 494T four-plate cooker

Faraday Lecture in London

THE Faraday Lecture of the Institution of Electrical Engineers will be given in London on 17th February at the Central Hall, Westminster, at 6 p.m. As our readers will already know, the title is "Electrical Machines," and it is being presented by Prof. M. G. Say. Admission to the lecture is free by ticket and applications should be made to the Institution, Savoy Place, W.C.2.

Heat from Modern Electric Lamps

EFFECT ON CABLE DIELECTRICS

The recent reduction in the envelope size of g.l.s. lamps has allowed the use of higher wattage lamps in fittings designed to the old lamp ratings. This can give rise to premature failure of the insulation of the connecting cable. The Cable Makers' Association have therefore issued the following statement

IT is apparent that the life in service of conventional types of wiring cables and flexible cords when used in association with modern lamps and fittings is causing some concern owing to the increasing temperatures being experienced. In the circumstances the Cable Makers' Association feel that a re-statement of the temperature limitations which apply to the various types of cables which are now available would serve a useful purpose to all who are concerned with the design and installation of lighting systems.

Some years ago the British Electrical and Allied Industries Research Association carried out some work on measurement of the temperatures encountered in lampholders (E.R.A. Report F/T138), and it was discovered that with the type of fittings then used for office and factory lighting, lamps of 100 W could cause temperature rises at the lampholder terminals of about 80°C above ambient temperature. Temperature measurements carried out on the core insulation $\frac{3}{8}$ in away from the lampholder terminal showed that the temperature rise could be greater than 60°C. This meant that when a lighting fitting was used in an ambient air temperature of 25°C the temperature attained by the rubber insulation could be above 85°C.

Size and Rating

More recently, the physical sizes of many lamps have been reduced so that it is now possible, for example, for a 100 W lamp to be used in an enclosed type of fitting which previously was designed to accommodate a maximum lamp size of 60 W. This can give, and has in fact given, rise to much higher temperatures at the lampholder terminals than those mentioned in the above E.R.A. Report. As an extreme case of what can happen, there have been instances where certain types of fittings on board ships have been incorrectly fitted with 100 W bulbs where they were only intended to have 60 W lamps. When the ships have been sailing through tropical waters where the cabin air temperature has been as high as 40°C it was found that the temperature of the rubber insulation was as much as 160°C.

Reference to the Thirteenth Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings shows that they contain the essence of desirable practice. In Regulation 211 (B) rubber, p.v.c. and polythene insulated cables or flexible cords are recommended for operating in ambient temperatures not exceeding 45°C which means that if a cable is fully loaded to its maximum I.E.E. current rating the increase in temperature due to the passage of the current will not raise the temperature of the cable insulation to much more than the safe value of about 60°C.

Regulation 211 (B) also stipulates that unless cables and flexible cords are of a special design which permits them to withstand high temperatures they shall not be brought into lighting fittings where, under normal work-

ing conditions, the conductor is likely to attain an excessive temperature owing to the transfer of heat.

As indicated by the extract from the I.E.E. Wiring Regulations quoted above there are accepted maximum temperatures for the three most common materials used today for the insulation of wiring cables and flexible cords. When the cables and cords are operated at temperatures in excess of the recognised limits this leads to progressively rapid deterioration and premature failure in service. A few comments on the available forms of insulation will not be out of place.

(a) *Natural Rubber*.—Natural rubber insulation as used, for example, to insulate cables to B.S.7, is only suitable for temperatures up to about 60°C and under normal conditions a rubber insulated cable can have a useful life of well over 20 years. However, at higher temperatures the rubber ages with increasing severity and with increase of temperature which can be encountered in lampholders with, say, 100 W lamps, the life of the rubber insulation can be reduced to a few years only. In addition, when natural rubber insulations are heated to temperatures above about 130°C, there is a tendency for the rubber to become very soft in the early stage of its life and this can result in the insulation flowing away from the conductor at points where the core is under any mechanical pressure so that a short circuit can occur between a live conductor and the earthed metalwork of a fitting. Thus, in the case of the ship lighting fittings mentioned earlier, electrical failures have frequently taken place.

(b) *Polythene*.—Polythene insulation as employed, for example, in B.S. 1557 cables, can be safely used at temperatures up to 70°C. I.E.E. Regulation 211 (B) specifically mentions the danger, however, of using polythene insulated cables at high temperatures as this form of insulation has a sharp melting point of around 110°C.

(c) *Polyvinyl Chloride*.—Cables and flexible cords insulated with p.v.c., e.g. to B.S. 2004, can be safely used at temperatures up to 70°C. At temperatures above this, there is a risk of the insulation flowing away from the conductor if the core is under any mechanical pressure.

Various types of high-temperature-resistant p.v.c. compounds are now available, but even so they must be used with caution in view of the very high temperatures obtained in many lighting installations.

(d) *Polychloroprene*.—Polychloroprene (neoprene) has from time to time been suggested for the high-temperature connections to lamps, but this synthetic rubber, although perhaps equal to natural rubber in its ageing properties in the region of 60°C or 70°C, is still unsuitable for the very high temperatures which are often encountered in fittings. It has been found that when polychloroprene insulation has been subjected to an elevated temperature for a time and then the insulation has been allowed to cool to normal room temperature, there has been a large absorption by the aged insulation of moisture from the atmosphere with the result that it quickly fails electrically.

(e) *Butyl Rubber*.—Butyl rubber insulated cables are a fairly recent introduction and a new British Standard is

being prepared to cover these types. This insulation has certain high temperature advantages over those mentioned above, but nevertheless, its maximum operating temperature, unless the core is protected by asbestos rovings, should not exceed 85°C. At this point, a warning should be sounded against using butyl rubber at very high temperatures such as are encountered in some lighting fittings. Although butyl rubber has superior heat resistance to natural rubber at moderately high temperatures, it has been discovered that at higher temperatures in the region of 130°C or 140°C butyl rubber insulation compound may very quickly age and, in the same way as natural rubber, it eventually becomes very hard. In addition, it can finally turn into powder and easily drop off the wire if the insulation is disturbed in any way or subjected to vibration as, for example, on board a ship.

(f) *Varnished Cambric/Heat-Resisting Fibre.* — Cables insulated with a composite covering of varnished cambric and heat-resisting fibre are to be included in a new British Standard at present being formulated. This form of insulation may be operated at a maximum temperature of 85°C, but it should only be used in dry situations owing to its somewhat hygroscopic nature.

(g) *Butyl Rubber/Asbestos Roving.* — Cables insulated with butyl rubber, over which is applied on each core a lapping of asbestos roving, are also included in a new British Standard now being prepared. These cables are suitable for operating at a maximum temperature of 100°C which is slightly in excess of the maximum operating temperature for ordinary butyl insulated cables mentioned in (e), but nevertheless, the insulation can still be liable to the same shortcomings as ordinary butyl rubber at high temperatures in the region of 160°C.

(h) *Silicone Rubber.* — Cables and flexible cords insulated with silicone rubber can be safely operated continuously at temperatures up to and including 150°C and for intermittent periods up to 200°C. A new British Standard is being prepared to cover these types.

It is difficult for the cable maker to go much beyond drawing attention to the temperature limitations of the various cable insulation materials since the design of lamps and fittings is beyond his control. It would seem apparent from the earlier E.R.A. work and the known trends in the development of lamps and fittings that the stage has been reached where unless adequate precautions are taken there is a serious risk of lighting installations being the cause of failure of the associated cable or flexible cord.

It cannot be too strongly stressed that it is most important that those who design and install lighting fittings should be aware of the limitations of rubber-like and thermoplastic insulations at high temperatures. Every effort should be made to design fittings so that the temperature likely to be attained at the terminals of the lampholder is kept to a reasonable level having regard to the limiting temperatures quoted in items (a) to (h) above.

If it is not possible so to limit the temperatures to which the cables are subjected the fitting should be so arranged that heat-resisting tails can be easily run from the lampholder itself to a terminal block mounted in a cool accessible position where connection may be made to the standard wiring cable.

Suitable high-temperature tails include wires insulated with silicone rubber, as described in (h) above, where the insulation may be further protected, if required, by a covering of glass fibre treated with silicone varnish in which case the maximum operating temperature will be 150/200°C. For temperatures above 150/200°C, the most practical type of insulated tail consists of bare wires upon which are threaded porcelain beads.

With the present trend to reduce lamp bulb sizes resulting in higher operating temperatures, there is the

increasing serious problem of maintaining existing wiring installations in a safe working condition.

In the case of pendant lighting fittings, the replacement of the existing pendant flex between the lampholder and the fixed wiring by one of the heat-resisting types of flex will largely overcome the trouble. However, where lighting fittings are directly connected to the building wiring, as, for example, with ceiling fittings, there is always danger of the cable insulation failing with the resultant fire risk and the provision of suitable new wiring to withstand the high temperatures could be a costly business. A temporary method of overcoming the difficulty is to fit over the cable ends high-temperature-resisting insulating sleeves made from materials such as silicone varnished glass braiding. This may not always be a practical method, however, as the dimensions of many fittings do not allow the sleeving to be accommodated.

The above suggested replacement or treatment of existing cables to cater for the higher temperatures might be readily tackled by electrical engineers and electricians who appreciate the problems involved, but unfortunately there are the non-technical general public purchasers of large quantities of lamps who must also be considered.

If it is now possible to fit a 100 W lamp into an enclosed fitting designed for a maximum lamp size of 60 W the man in the street will not hesitate to use the larger wattage lamp if he wants more light. He does not appreciate the problem of the high temperatures involved and, therefore, he cannot be expected to realise that the wiring in and adjacent to the fittings may very quickly reach a dangerous condition.

The only real answer to the problem is the use of well-designed fittings together with lamps no higher in wattage than that for which the fittings are rated. This would ensure that the heat at the cable entry and connection points is not greater than that which the various components can withstand.

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Water Heating in All-Electric Flats"

THE article in your issue of 30th October by Mr. G. O. McLean under the above title contains a reference to one of our refrigerators which we feel requires clarification.

The author's statements about "an insulated 3 cu ft cupboard" for "either wall mounting or at ground level" do apply to our standard Prestcold domestic refrigerator which is illustrated. His other statements about containing a plain tube evaporator with a manually adjustable expansion valve, and the need for an extra evaporator in certain winter circumstances, do not apply to our standard Prestcold practice and are part of the author's own views as to what might be done in the way of a combined heat-pump and refrigeration installation in the theoretical block of flats about which he writes.

In other words, the article is a speculative one suggesting measures which could be applied and a Prestcold refrigerator has been used as an example only because its convenience in size and positioning arrangements give it special advantages for use in flats. We appreciate that any other interpretation is a misunderstanding of the author's intention, but we feel that this situation could arise in the minds of some readers.

Oxford.

F. E. EVANS,
Press Officer,
Pressed Steel Co., Ltd.

HIRFANLI HYDRO-ELECTRIC PROJECT

£23 MILLION BRITISH-BUILT
SCHEME IN TURKEY

The earthquake-proof power station and tailrace



THE run-of-river Hirfanli hydro-electric project in Anatolia, Turkey, was officially opened on 8th January by the Prime Minister of the Turkish Republic, Mr. Adnan Menderes. The Turkish President, Mr. Celal Bayar, and the British Ambassador to Turkey, Sir Bernard Burrows, K.C.M.G., were also present at the inauguration.

The project includes a 270ft high and 1,200ft long earth- and rock-filled dam at Hirfanli across Turkey's longest river, the Kizilmirmak. The dam is the largest of its type in Europe. A new lake has been created behind the dam, 46 miles long and nine miles across, from which water is fed to the turbines in the newly-built power station. The dam will also regulate the supply of water to four other power stations downstream, the first of which is under construction.

The power station has now been completed and

Turbine hall showing the three 36.8 MW sets



houses three 44,000 h.p., 36.8 MW turbo-generators rotating at 187.5 r.p.m. Provision has been made for installing a fourth set. The turbines are of the reaction type and were supplied by the English Electric Co., Ltd. The runners are of all-welded construction and are protected against cavitation by stainless steel. The turbine has self-lubricating bearings and drives an umbrella-type alternator which is also of English Electric manufacture.

Three 40 MVA three-phase generator transformers step up the generator voltage from 10.6 kV to 154 kV for transmission to a switchyard situated on the top of a hill above the power station. The switchyard is spanned by a series of 36 85ft high steel towers which support the busbars carrying incoming and outgoing power circuits, each of which is controlled by English Electric air-blast circuit-breakers.

The civil works of the project, which include the earth- and rock-filled dam, the reinforced concrete power house and the power intake are massively designed to withstand earthquakes. Water is fed into the power house from the intake via two 26ft diameter concrete-lined tunnels. Each of these tunnels then divides into two steel-lined penstock tunnels 16ft 3in in diameter.

The dam and accompanying civil engineering works were built by the Wimpey Organisation, London. The scheme was designed by the American consulting engineers Tippetts-Abbett-McCarthy-Stratton, in consultation with the engineers of the Turkish State Water Board.

Vehicle Cables

THE new edition of B.S. 1862, "Cables for Vehicles," deals with both cables for the ignition and for the lighting, starting and auxiliary wiring of road vehicles. A p.v.c.-insulated ignition cable has been introduced and the stranding of the rubber-insulated ignition cable has been changed. The range of p.v.c.-insulated light-duty cables now includes single-core cables without further covering and twin- and three-core cables insulated and sheathed with p.v.c. compound. In some sizes alternative conductors are now given to provide for greater or less flexibility.

The test requirements are generally similar to those of the 1952 edition but no oil may now penetrate the lacquered braid of rubber-insulated low-voltage cables, and tests in lubricating oil, fuel oil and petrol have been introduced for p.v.c.-insulated low-voltage cables. Particulars of bare earthing braids are given for the first time.

Copies may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 7s 6d.

INDUSTRIAL NEWS

New Conditions of Contract Form for Exports

A new Model Form of General Conditions of Contract, known as "B.2 (1960)—Export Contracts—Delivery f.o.b., c.i.f. or f.o.r., with Supervision of Erection," has been prepared by the Joint Committee on Model Forms of General Conditions of Contract of the Institution of Mechanical Engineers and the Institution of Electrical Engineers and published under the authority of the Councils of the two Institutions and is now available from the secretary of the Institution of Mechanical Engineers or the secretary of the Institution of Electrical Engineers at 4s 6d.

The I.E.E. Model Form "B.2 (1928) (Export—including Complete Erection or Supervision of Erection)" is now superseded and has been withdrawn.

The other forms completing the range, issued jointly by the two Institutions, are "B.1 (1956) (Export—Delivery f.o.b. or c.i.f.)" (4s 6d) and "B.3 (1954) (Export Contracts—including Delivery to and Erection on Site of Electrical and Mechanical Plant)" (5s).

The Association of Consulting Engineers also recommends to its members the use of these forms and its name accordingly appears on the title page of each of them.

Engineering Hours and Wages

Determination to pursue their claim for an extra £1 a week for their members as well as a forty-hour week was expressed by the leaders of the Confederation of Shipbuilding and Engineering Unions at a meeting with engineering employers' representatives last week. The employers, without holding out much hope of agreement to an increase in wages, undertook to place the claims before their constituent firms again and report the result at the next meeting between the two parties, on 26th January.

The employers have already offered to reduce the working week from 44 to 42½ hours but at last week's meeting Mr. W. J. Carron insisted that the engineering industry was able to concede a 40-hour week. Reference was made to the reduction of the working week to 42 hours in the electricity supply and in other industries and firms.

Work Resumed at Hunterston

The dispute at Hunterston nuclear power station, Ayrshire, has now been settled. After a 15-week stoppage, the Motherwell Bridge & Engineering Co., Ltd., on 11th January resumed operations on its £8 million contract for building the reactor spheres and steam-raising vessels at Hunterston nuclear power station. The company had suspended operations because of

persistent unofficial strikes. Last month it offered a new wage structure and this was accepted by five of the six unions involved. The remaining union, the Boilermakers' Society, finally agreed to accept the terms on 9th January.

The station, where 1,400 men engaged on other contracts remained at work during the dispute, is being built for the South of Scotland Electricity Board at a cost of £40 million. As a result of the unofficial strikes and the 15-week stoppage, it is now more than a year behind schedule.

Enfield-Standard Power Cables

We recently announced the merger of the power cable businesses of Enfield Cables, Ltd. (a wholly owned subsidiary of Enfield Rolling Mills, Ltd.) and Standard Telephones & Cables, Ltd., and recorded in our last issue the formation of a new company, Enfield-Standard Power Cables, Ltd., as a result. The new company commenced operations on 1st January with registered offices at Connaught House, 63, Aldwych, London, W.C.2, and main works at Brimsdown, Middlesex.

Mr. F. C. Wright, managing director of Standard Telephones & Cables, and the Hon. John Grimston, managing director of Enfield Cables and Enfield Rolling Mills, will alternate as chairmen of the new company. Principal officers of the company are Mr. E. C. Lee, general manager; Mr. G. H. Bairstow, general works manager; and Mr. M. J. Smith, commercial and technical manager.

Plant for Korea

Dale Electric (Yorkshire), Ltd., has received a contract for the supply of diesel alternator sets for a telecommunication scheme for Korea. The plant includes 16 kVA diesel alternator sets, consisting of

P3144 engines, monobloc coupled to self-exciting self-regulating alternators. A batch of 75 kVA sets, also being supplied, are also of monobloc construction and employ Dorman 6LB engines. Other plant includes a 100 kVA version incorporating the Dorman 8LB engine, monobloc coupled to a self-exciting self-regulating alternator.

The company informs us that it supplied two 25 kVA generating

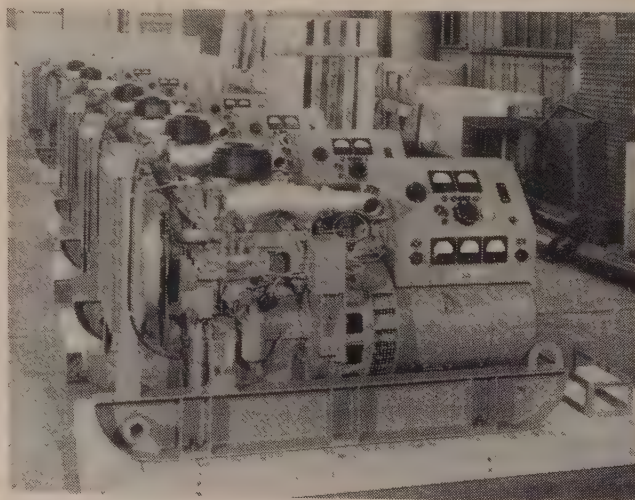
sets for the outside broadcast units recently shipped by E.M.I. Electronics, Ltd., for the Australian Broadcasting Commission.

Cologne Hardware Fair

Final arrangements are now being made for the display by B.E.A.M.A. members at the Cologne Hardware Fair to be held from 11th to 14th March. The arrangements have been made in conjunction with the Board of Trade and the exhibits will cover domestic electrical appliances. The B.E.A.M.A. firms are taking part in the composite exhibit and there will also be a fully manned information bureau with multi-lingual interpreters. The firms concerned are: Columbus-Dixon, Ltd.; Corfield-Sigg, Ltd.; Dimplex, Ltd.; Electrix, Ltd.; English Electric Co., Ltd.; Hoover, Ltd.; Electrical Division of Radiation, Ltd.; Remploy, Ltd.; Revo Electric Co., Ltd.; and Simplex Electric Co., Ltd.

Kelvin Hughes, Curtiss-Wright Agreement

An agreement, taking effect immediately, has been concluded between Kelvin & Hughes, Ltd., and the Curtiss-Wright Corporation of America for the exclusive right to manufacture and sell the non-destructive testing equipment of the other partner. This includes instruments for the inspection and measurement of materials, and equipment employing ultrasonic techniques in all industrial fields. The agreement covers certain defined territories. Kelvin Hughes will represent both interests in the United Kingdom, the Commonwealth (except Canada) and Europe, and Curtiss-Wright in the U.S.A. and Northern America. Each party to the agreement will offer full sales and service facilities on the joint range of



A batch of 16 kVA diesel alternator sets which Dale Electric (Yorkshire), Ltd., is supplying for a telecommunication scheme in Korea

equipment. Kelvin Hughes has developed a range of manual, semi-automatic and automatic ultrasonic test equipment. Curtiss-Wright also manufactures ultrasonic equipment but has, in addition, a range of industrial radiographic equipment using X-ray and gamma ray techniques.

U.K.A.E.A. Pay Increases

The United Kingdom Atomic Energy Authority, at a meeting of the General Purposes Committee of its National Joint Industrial Council on 6th January, agreed to wage increases for manual workers. Craftsmen will receive an increase of 10s 6d a week and general workers will receive 9s. The new rates operate from 4th January.

Scottish Contracting Prices

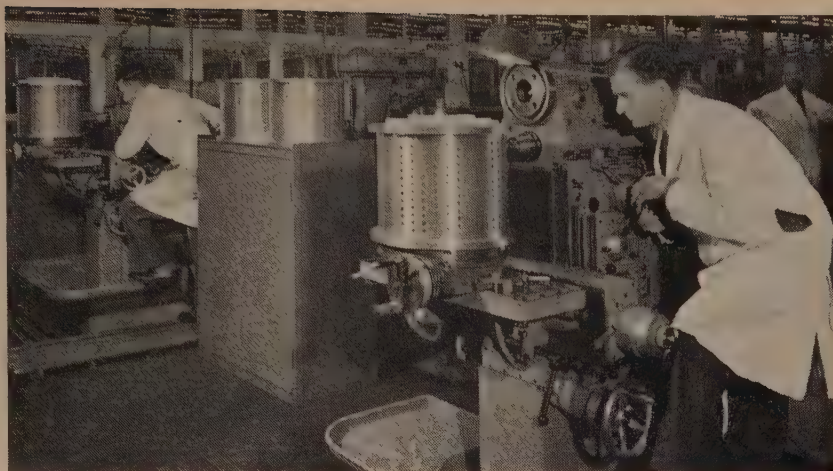
Arrangements have been completed between the Electrical Contractors' Association of Scotland and the South of Scotland Electricity Board for revision of the water heating and cooker circuit prices applicable in installation work. The new rates came into operation from 1st January and are designed to allow competitive installation of electrical services as against alternative services. The Association is also discussing with the architects' bodies the possibility of revision of schedules whereby cutting of ways and making good would be regarded as essentially an item for the building schedule and not the electrical installation schedule.

G.E.C. and "Piped" Television

General Piped Television, Ltd., has been formed by J. F. Thomasson & Co., merchant bankers, with the intention that a controlling interest in it shall be acquired by Pillar Holdings, Ltd. The company will provide a television service to viewers' homes anywhere in the country by a relay system. The General Electric Co., Ltd., which is subscribing for shares in the new company, will provide full technical assistance for the signal distribution. General Piped Television, which has an authorised capital of £100,000, is an extension of the system already operated in Wales by Piped Television (Wales), Ltd., an existing subsidiary of Pillar Holdings. The directors are: Mr. B. L. Arnold (Piped Television (Wales), Ltd.), Mr. M. M. MacQueen (General Electric Co., Ltd.), Mr. J. R. Stopford and Mr. J. F. Thomasson (both of Pillar Holdings, Ltd.).

Magnetic Storage Drums

A range of magnetic storage drums is now in production at the Brentford and Feltham factories of the Sperry Gyroscope Co., Ltd., to meet the requirements of automatic telephone exchanges and the latest digital computers. Type A and B drums, the latter of larger capacity, have been developed in co-operation with the Automatic Telephone & Electric Co., Ltd., for automatic telephone opera-



Machining magnetic storage drum mantles

tion but are also suitable for computer applications. These are to be delivered to G.P.O. exchanges throughout Britain for subscriber trunk dialling.

The larger type C units have been designed to meet the requirements of computer manufacturers, in particular Standard Telephones & Cables, Ltd. Two standard sub-assemblies comprising a motorised drum unit and multiples of slave drum units are coupled together to form a cylindrical assembly with a common vertical axis. Each recording drum is surrounded by a mantle drilled to a standard pattern of head-mounting positions, affording a variety of single, double and multiple head tracks. The motorised unit also contains a three-phase inverted squirrel-cage motor, wound for a line voltage of 190 V, unless otherwise specified, and incorporating Class B insulation, and an eddy current braking disc. A solenoid-operated pump unit supplies metered quantities of lubricating oil from a reservoir to the bearings of each drum assembly. An alarm system incorporated in the pump unit closes a pair of normally open contacts to operate any suitable warning device if the oil supply fails. The largest C type drum has a 40in length of recording surface with 1,000 tracks at 0.040in pitch and 1,736 magnetic head positions. A $\frac{1}{2}$ h.p. motor drives the drum at 1,500 r.p.m.

The Electrical Wholesaler

Under this title a booklet has been produced by the Electrical Wholesalers' Federation, 34-37, Cursitor Street, London, E.C.4, to explain who and what the wholesaler is and what he does. It is shown that the genuine wholesaler renders useful service by stocking the products of many manufacturers which he makes conveniently available to his customers who are thus able to obtain their requirements more rapidly than by dealing directly with manufacturers. Moreover, by this system the retailer or contractor is relieved of the burden of carrying large stocks himself. The wholesaler extends credit facilities to his customers, thus taking over the manu-

facturer's risks, and he also reduces the number of the accounts which the manufacturer has to keep.

The wholesaler, in addition, benefits the public by enabling the retailer to offer a wider choice. These and other points are illustrated by amusing little sketches. It is noted that the E.W.F. now has 221 members whose names and addresses are available from the Federation.

Edmundsons' Acquisition

Edmundsons Electric Co., Ltd., announces that T. Stanley Weston & Co., Ltd., 194, Bath Street, Glasgow, has joined the Edmundsons group of companies. T. Stanley Weston & Co., Ltd., was incorporated in 1931 and specialises in the sale of commercial and decorative lighting fittings and domestic appliances. Mr. T. S. Weston, chairman of the Scottish Section of the Electrical Wholesalers' Federation, will continue in his capacity of company director.

Commercial Catering Course

A residential commercial catering course held at Will's Hall, Stoke Bishop, Bristol, from 4th to 8th January, was organised by the Electrical Development Association and the South Western Electricity Board. Other Electricity Boards who participated in the course were South Wales, Midlands, Southern and London. The students, who numbered about sixty, were welcomed by Mr. A. N. Irens, chairman of the South Western Board. During the week a number of papers were given. The speakers were:—Mr. A. L. Mitchell (G.E.C., Ltd.), Mr. R. Goodwin (Gardiner & Gullard, Ltd.), Mr. E. C. Simmonds (Peerless & Ericsson), Mr. J. C. Edwards (James Hall & Co.), Mr. D. E. Hall (Prestcold), Mr. H. K. Tomkins (Radiation (Large Cooking Equipment), Ltd.), Mr. E. M. Ackery (E.D.A.), Mr. E. Briggs (North Western Electricity Board) and Mr. L. H. Carmalt (Simplex Electric Co., Ltd.).

An exhibition of a representative range of electrical commercial catering equipment was held in conjunc-

tion with the course. The exhibitors were:—Electroway Heaters, Ltd.; EUK Catering Machinery, Ltd.; Gardiner & Gulland, Ltd.; General Electric Co., Ltd.; Peerless & Ericsson; Radiation (Large Cooking Equipment), Ltd.; John Rouse (Oldham), Ltd.; Simplex Electric Co., Ltd.; and James Stott & Co. (Engineers), Ltd.

English Electric Aircraft Business

On Tuesday last it was announced that the aircraft and guided weapon activities of the English Electric Co., Ltd., are to be amalgamated with the similar activities of Vickers and the Bristol Aeroplane Co. For this purpose a new company will be formed with three wholly-owned subsidiaries, one of which will be English Electric Aviation, Ltd. The shares of the holding company will be owned as to 40 per cent by Vickers, 40 per cent by the English Electric Co. and 20 per cent by Bristol Aeroplane.

C.M.A. Member

The Cable Makers' Association announces that Crompton Parkinson, Ltd., rejoined the Association on 1st January.

New Morphy-Richards Companies

The Morphy-Richards Group has formed two new companies—Morphy-Richards (Cray), Ltd., and Morphy-Richards (Sales & Services), Ltd. Mr. C. F. Richards, joint managing director of the group, states that the registration of these two new companies represents purely a form of reorganisation to which the chairman referred in his statement at the last annual general meeting, when he said that Morphy-Richards, Ltd., was both the parent of a large and expanding group of companies and was itself one of the major operating companies within the group. This had inconveniences which the board thought should be overcome by making Morphy-Richards, Ltd., purely a holding company and by forming two wholly-owned subsidiary companies.

Aluminium Company's 25th Anniversary

To mark the completion of its first twenty-five years, the Star Aluminium Co., Ltd., Wolverhampton and Bridgnorth, manufacturers of aluminium foil, has issued a well-produced and illustrated brochure outlining its history, its activities and some of the many applications of tinfoil.

Thermometal Booklet

A booklet recently published by Henry Wiggin & Co., Ltd., provides basic information on "Wilco-Wiggin Thermometals," a brief description of the various grades and a series of tables showing the thermal properties, formulae for various shapes and temperature-deflection. Short articles on fabrication, heat treatment and mounting are included in this publica-

tion which can be obtained free on request from the publicity department of the company at Thames House, Millbank, London, S.W.1.

Infra-Red Heat Film

A film entitled "Infra-red Heat in Industry" is available from the General Electric Co., Ltd. The film explains what infra-red heat is and shows in interesting fashion its applications to industrial processes such as plastics, paint stoving and nylon setting. The film is a 16 mm colour sound film for projection at silent speed and has a running time of 18 minutes. Applications for the free loan of the film should be made by interested bodies to the Industrial Heating Department, G.E.C., Magnet House, Kingsway, W.C.2.

Welding Exhibition

An exhibition called "Focus on Welding" will be held from 20th January to 22nd January (inclusive) at the Merseyside and North Wales Electricity Board Electrical Industrial Development Centre, 83, Paradise Street, Liverpool, 1. The exhibition, which is organised by the English Electric Co., Ltd., in association with MANWEB, covers arc welding equipment, in particular equipment giving a.c. and d.c. from one unit, and electrodes, including the electrodes called "Groovees" which are used for grooving, gouging and piercing.

Lighting Fittings for the "Oriana"

Heyes & Co., Ltd., Wigan, have supplied 640 lighting units for installation in the new 40,000-ton passenger liner *Oriana*. Launched in November by Princess Alexandra, the liner will cost approximately £14 million and is being built for the Orient Steam Navigation Co., Ltd., by Vickers Armstrongs (Shipbuilders), Ltd., Barrow-in-Furness. A total of 180 Heyes 323 60 W prismatic fittings will be installed in *Oriana's* cold rooms and in adjacent lobbies, insulated holds and the duct keel compartment and a further 460 "Lacent" type 414 lighting fittings in the ship's bonded store, wine, flour and potato stores, tobacco, beer, mineral and baggage rooms, crew's service lockers, store handling spaces and spiral staircases.

Nuclear Damage and Insurance

Injury to the person and damage to property caused by ionising radiation or contamination by radioactivity from nuclear fuel or waste are to be excluded from insurance policies covering damage to property or liability to third parties. Announcing this, the British Insurance Association and Lloyd's say that the Nuclear Installations (Licensing and Insurance) Act, 1959, provides that the operator of the installation concerned shall compensate anyone affected by an escape of radioactivity from a nuclear installation. The new arrangement does not apply to life insurance, pension,

personal accident or sickness policies, nor does it extend to other sources of ionising radiations, e.g. radio-isotopes, X-ray machines and particle accelerators.

Revisions of the draft code for the protection of workers engaged in operations involving the production, emission or use of sealed sources of ionising radiations are contained in the second preliminary draft of the Factories (Ionising Radiations) Special Regulations (H.M. Stationery Office, price 1s 3d) published on Monday. The schedule specifying the maximum permissible radiation doses has been remodelled and a number of definitions are revised.

Atomic Power Exhibition

An "Atoms at Work" exhibition, arranged by the United Kingdom Atomic Energy Authority, is now in progress at the Institute of Technology, Bradford. The twin themes are Britain's atomic power programme and the uses of radioisotopes. Admission to the exhibition, which closes on 23rd January, is free.

Practical Electrician's Pocket Book

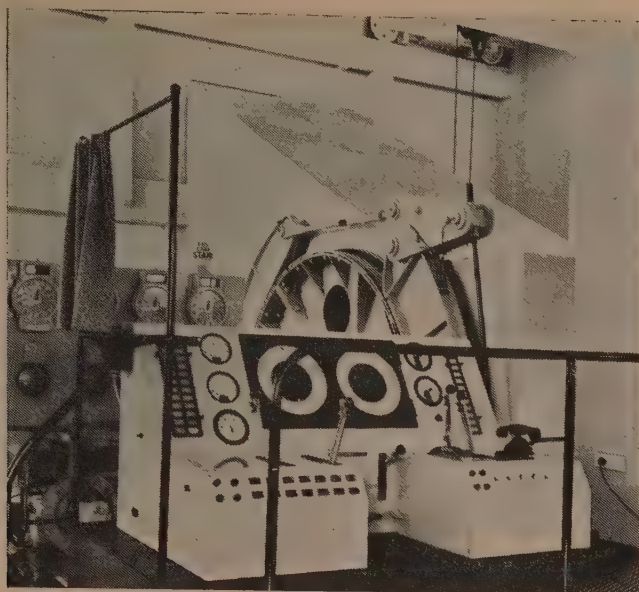
The 1960 edition of "The Practical Electrician's Pocket Book" (Odhams Press, Ltd., price 7s 6d) has a number of new features, including chapters on public address, semiconductors, storage batteries, refrigerators, education in the electrical contracting industry, and tariffs. Other sections have been revised. The chapter on instruments reviews and explains the various types, particularly from the electrician's viewpoint. The one on wiring now deals with the pros and cons of the protective earthing system, and that on space heating contains more details of the several floor warming systems now being installed.

Murrayfield Installation in Use

The under-turf heating installed last summer at Murrayfield, Edinburgh, the Scottish Rugby headquarters, was switched on for the first time on 7th January to keep the pitch playable for the international match two days later between Scotland and France. The installation, which cost £10,000, consists of 39 miles of heating cables buried 6in deep. The main contractors were George Mackinlay & Co., Glasgow, who installed all the electrical equipment. The heating cables and switchgear were supplied by the General Electric Co., Ltd., and the cable was laid by Harrison, McGregor & Guest, Ltd., a David Brown company.

Frigidaire Employees' Paid Holidays

Additional paid holidays, over and above the present two weeks, have been announced for a large number of employees of the Frigidaire Division of General Motors, Ltd. The additional holidays, which will come into effect this year, range from one



The two central dials in the winder control desk show the position of the cages in the shaft

day to one week according to the status and service of individual employees. In all cases they will be over and above the existing two weeks' annual holiday and the normal arrangements regarding public holidays. Employees being granted an extra week will include technical, specialist and senior staff over twenty-five years of age and with a minimum of one year's service, while employees over twenty-one years of age in all other grades will be given additional paid leave ranging from one to five days according to service qualifications.

Russian Scientists' Visit

Four scientists, members of the Russian fast reactor team, have been on a visit to this country this week, during which they have visited the fast breeder reactor at Dounreay, and Calder Hall and Harwell.

"Magicoal" Fire Production

Production at Berry's Electric new factory at Bletchley has started and although not yet in full operation it is announced by the company that improved deliveries of "Magicoal" electric fires will soon be possible in both home and overseas markets.

The factory will be administered by the Berry's "Magicoal" works at Wembley and should prove to be an important factor in catching up with the company's huge arrears of orders.

Australian Mine-Winder

The largest a.c. winder so far commissioned in Australia, and the first to be fitted with power-operated brakes, was recently installed at a mine near Newcastle, New South Wales, by Australian Electrical Industries Pty., Ltd. The winder, driven by a 1,100 h.p., 570 r.p.m., 6,600 V 50 c/s slip-ring induction motor, is designed to raise 300 tons of coal an hour from a depth of 720ft. Speed variation and direction of winding are governed by

a liquid controller and an air-break reversing contactor. A single-reduction gearbox connects the motor to the winding drums, the maximum speed of which is 68 r.p.m. In addition to the mechanical brakes, the driver has an electrical braking system which incorporates regenerative braking, reverse current and dynamic braking. The main electrical equipment for the winder was manufactured by the A.E.I. Heavy Plant Division, Rugby, the auxiliary equipment by Australian

Electrical Industries at their Sydney Works, and the mechanical equipment by Marfleet & Weight, Melbourne, to the design of Markham & Co., Ltd., Chesterfield.

Trade Announcements

Wayne Kerr Laboratories has established a special section that will assist in solving industrial and scientific measurement problems. The new section is known as the Applications Group of the Industrial and Electronics Division. It will be under the direction of technical director Mr. G. G. Gouriet, M.I.E.E. The Applications Group may be consulted for a strictly advisory service, or to develop new instruments into fully engineered form. The administration offices of the group are at 44, Coombe Road, New Malden, Surrey.

William McGeoch & Co., Ltd., announce the following new appointments in their sales organisation:—Mr. P. G. Payne, senior sales engineer, to be sales manager. Area sales engineers: London (West), Mr. D. J. Cabbage (late Crompton Parkinson/Fosters); London (South), Mr. R. M. Page (late Crompton Parkinson); Midlands (North), Mr. L. D. Fitzmaurice (late Veritys, Ltd.); Midlands (South), Mr. H. C. B. Woodcock (late Philips Electrical, Ltd.); North West (Lighting Division), Mr. A. Moorefield (late Veritys and Popes Lamps); North East, Mr. J. Hornby (late Carron Company). The sales organisation of William McGeoch & Co., Ltd., now covers the associate companies, Veritys (Maxlume), Ltd., and Veritys (Switchgear), Ltd., both of Aston, Birmingham, 6.

The headquarters and administrative staff of the Industrial Division of the **Simplex Electric Co., Ltd.**, has moved to the company's head office at Creda Works, Blythe Bridge, near Stoke-on-Trent. The production of

the Simplex factories at Oldbury and Blythe has been rationalised to secure more efficient production and better service to customers.

Negotiations are proceeding which, if successfully concluded, will result in the acquisition by the **Pye Group** of approximately 50,000 sq ft of factory buildings in the Sheerness Dockyard. The premises would be used as additional facilities for the production of high fidelity sound reproducers, electro-medical equipment, naval communications equipment and high-grade test instruments for the electronics industry.

Nash & Thompson, Ltd., have acquired a second factory at Hook Rise, Tolworth, within 200 yards of their present research and production unit in Oakcroft Road, Chessington, Surrey. The new premises have increased the available space by 35,000 sq ft and the transfer of administrative departments, research and development and some production departments has now been completed.

A new service depot for London and the Home Counties has been opened by the British Materials Handling Division of the **Yale & Towne Manufacturing Co.** at Ripple Road South, Barking, Essex (telephone: Dominion 5945).

The address of the Manchester depot of **Luxram Electric, Ltd.**, is now 3, Bedlow Street, Chorlton-on-Medlock, Manchester, 1. The telephone number (Ardwick 5877) is unchanged.

J. Day & Co., Ltd., manufacturers of the "Davu" range of cables, announce the appointment of Mr. R. H. Coleman as their Midlands area representative covering Birmingham, Warwickshire, Worcestershire, Shropshire, Staffordshire, Leicestershire, Nottinghamshire and Derbyshire.

The telephone number of **Croxton & Garry, Ltd.**, has been changed to Kingston 9444.

Rhoden Partners, Ltd., have removed to 19, Fitzroy Square, London, W.1 (telephone: Euston 9696).

Diaries

The Trinidad and Tobago Electricity Commission has sent us a desk diary, the weekly pages of which are interleaved with some excellent West Indies scenes.

The pocket diary received from Associated Electrical Industries, Ltd., is bound in green leatherette and includes a number of thumb-indexed notes pages and maps of the world.

Lighting Fittings Exhibition

We are informed that due to unforeseen circumstances, the exhibition of lighting fittings which Rotaflex (Great Britain), Ltd., planned to stage at Swanson's Hotel, St. Helier, Jersey, from 18th to 23rd January, will now be held, instead, at the Pomme d'Or Hotel, Weighbridge, St. Helier, from 25th to 30th January.

GENERATION and DEVELOPMENT

New C.E.G.B. Generating Plant

During 1959 the Central Electricity Generating Board installed more than 2½ million horse-power of new generating plant. The total additional electrical output capacity of this new plant was 1,670 MW, which is well up on the previous year's figure of 1,154 MW but is still below the record figure of 1,797 MW in 1956.

Altogether 21 turbo-generators, with a total installed capacity of 1,775 MW, and 23 boilers, with an aggregate

installed by the Board, and it has a greater output capacity than any other unit operating in Western Europe. The associated boiler has an evaporative capacity of 1,400 klb/hr and the turbine stop valve conditions are 2,300 p.s.i. and 1,050°F with reheat to 1,000°F.

Steam Station Output

The Ministry of Power's latest statistical statement shows that 96,337 million kWh was sent out for public

school buildings at Westray and Stronsay the Orkney Education Committee decided to use diesel generating sets for lighting the schools and Clyde automatic pressure atomising type diesel burners for central heating.

Lister "Start-o-Matic" generating sets were adopted for the central heating, water and oil pumps, and the electricity supply to the headmasters' houses, and 19.5 kW generating sets for the lighting load and the stand-by supply for heater ignition.

Fuel oil reaches the schools by ship from Kirkwall and is pumped into 1,000 gal storage tanks by electrically operated pumps.

PLANT COMMISSIONED BY THE C.E.G.B. IN 1959

Name of Station	Project Group	Turbo-Generator Plant		Boiler Plant	
		Installed Capacity MW	Makers	Capacity klb/hr	Makers
Agecroft "C"	Northern	1 × 120	A.E.I.	1 × 860	International Combustion
Belvedere L.P.	Southern	3 × 60	English Electric	3 × 550	John Brown
Blyth "A"	Northern	2 × 120	A.E.I.	2 × 860	Babcock & Wilcox
Bold "B"	Northern	1 × 60	G.E.C.	1 × 550	John Thompson
Castle Donington	Midlands	1 × 100	A.E.I.	1 × 830	Babcock & Wilcox
Drakelow "B"	Midlands	2 × 120	Parsons	2 × 860	International Combustion
Elland	Northern	2 × 60	A.E.I.	2 × 550	Yarrow/John Brown
Ferrybridge "B"	Northern	1 × 100	Parsons	1 × 760	Babcock & Wilcox
High Marnham	Midlands/Northern	1 × 200	English Electric	1 × 1,400	International Combustion
Little Barford "B"	Southern	2 × 60	Parsons	2 × 550	Foster Wheeler
Marchwood	Southern	1 × 60	English Electric	1 × 550	John Thompson
Portishead "B"	Southern	1 × 65	A.E.I.	3 × 300	Mitchell Engineering
South Denes	Southern	1 × 60	Richardsons Westgarth	1 × 550	Mitchell Engineering
Spondon "H"	Midlands	1 × 10	A.E.I.	1 × 180	Foster Wheeler
Willington "A"	Midlands	1 × 100	English Electric	1 × 830	International Combustion

evaporative capacity of 14,700 klb/hr, were installed in fifteen power stations in England and Wales, five of which were new stations in which plant was commissioned for the first time. These new stations were Belvedere, Drakelow "B," Elland, High Marnham and Little Barford "B." Apart from Belvedere and Elland, these stations have been described in detail in past issues of the *Electrical Review*. Of the other stations referred to in the table above Agecroft "C" and Spondon "H" are new sections, while the remainder are existing stations to which extensions have been made.

In addition to the plant listed in the table, three boilers were commissioned which made no contribution to output capacity because the associated turbo-generators have not yet been commissioned. At Northfleet, a new station in which no plant has so far been commissioned, No. 1 boiler has been completed; it is a Foster Wheeler unit rated at 860 klb/hr. At South Denes No. 4 boiler, rated at 550 klb/hr and manufactured by Mitchell Engineering, has been commissioned. At Spondon "H" boiler No. 24, rated at 180 klb/hr and supplied by Foster Wheeler, was completed but not put on the steam range.

Of the generating units installed during the year the first of a number of 200 MW units planned for commissioning during the next few years was brought into service at High Marnham. This is the largest unit yet

supply from steam power stations in the 52 weeks ended 1st January. This represents an increase of nearly 7 per cent over the 1958 output (90,013 million kWh).

Immersion Heaters in Police Houses

Cumberland County Council has approved the installation of electric immersion heaters in 240 police houses at a cost of £3,000. The work is to be carried out over a period of three years.

Diesel Power for Orkney Schools

Owing to the remoteness of the northern group of the Orkneys there are no immediate plans for the electrification of the islands. Therefore, when planning the erection of new

Zebra Crossing Spotlights

Zebra crossings in poorly-lit streets are to be equipped with special lamps for spot-lighting pedestrians waiting on the kerb to cross the road. New regulations issued by the Minister of Transport require the attachment of an electric lamp to the beacon pole just below the globe. Only the pavement and the first few feet of the crossing will be illuminated in this way.

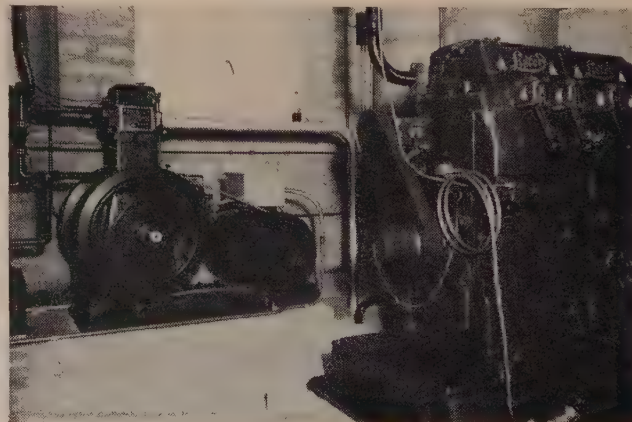
Transmission Line to be Raised

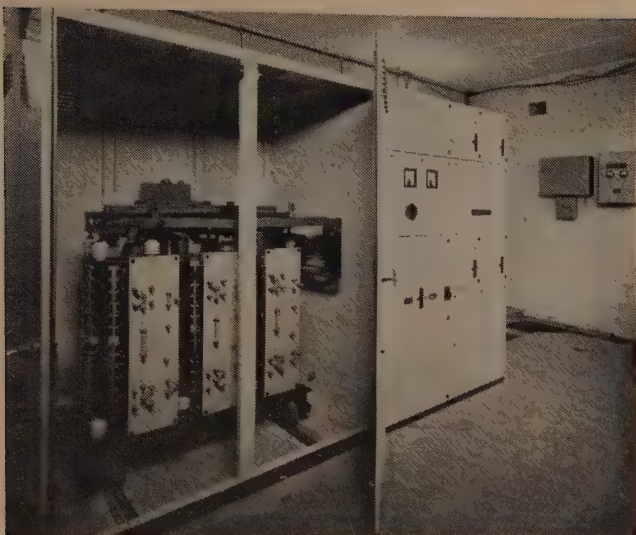
Aberdeenshire Planning Committee has been informed that the North of Scotland Hydro-Electric Board has agreed to heighten the poles carrying a transmission line across the grounds of Newton Dee House, one of the four Camphill-Rudolf Steiner schools near Aberdeen. This follows anxiety expressed regarding the safety of children attending the school.

All-Electric Houses for Old People

After discussing the Scottish Gas Board's new tariffs, Fife County Council Housing Committee decided on 5th January that in future its old people's houses should be all-electric. Mr. A. Eadie, chairman of the Committee, said that people were already taking gas out of their houses. In one area, at least, the con-

The power house at Pierowall School, Westray, showing (left) the 4.5 kW Lister "Start-o-Matic" generating set which supplies the central heating system, the school power points and the headmaster's house. The FR4 engine (right) drives the 19.5 kW generator which supplies the school lighting





English Electric 250 kVA "packaged" substation

tractors could not keep up with the change to electricity. Before making any decision about other Council houses, the Committee agreed to ask the Gas Board to be represented at the February meeting to explain the new gas tariffs.

Maintenance Costs

The North Eastern Electricity Board is to take over for an experimental period of three months the maintenance of equipment in all-electric houses on the Beacon Lough and Lyndhurst estates, Gateshead. The Council had asked the Board if it could suggest any means of improving methods and reducing costs. The Board agreed that the Council's costs seemed rather high, and offered to carry out maintenance work for a trial period to see how its costs compared with the Council's, and to assist if possible by offering advice on the methods used.

Indoor "Packaged" Substation

A typical installation of an English Electric indoor "packaged" substation is at the Mersey Docks, Liverpool, where a "Superform" switchboard controlling the outgoing circuits is coupled to a 250 kVA dry-type transformer in the same sheet steel enclosure. The switchboard comprises a type OB23 circuit-breaker controlling the output from the l.v. side of the transformer, and four fuse switch units. The transformer and the medium voltage switchboard are coupled directly together, requiring shorter cable runs which save copper costs and reduce voltage drop. No oil drainage pit or fire protection services are necessary for the class H insulated transformer which is cooled by air circulation through louvres on three sides of the transformer compartment. All live metal is totally enclosed. A safety interlock on the doors automatically trips the high voltage breaker if the doors should be opened while the incoming supply is alive.

If the load increases, the trans-

former of the same rating, will change to one of 750 kVA when the load increases.

OVERSEAS

Chilean Power Projects

A loan of \$32.5 million to cover the foreign exchange requirements for financing two power schemes in Chile has been approved by the World Bank. They are a 280 MW hydro-electric station to serve the central area and a 15 MW thermal station in northern Chile. The total estimated cost is \$72.3 million. The loan is being made to the Corporacion de Fomento de la Produccion and Empresa Nacional de Electricidad S.A. All the main power plant will be obtained through international tenders.

Electricity in the U.S.S.R.

Speaking at a recent meeting of engineers to consider means of speeding up the building of power stations, Mr. Krushchev announced a 20-year plan for electrical expansion that would secure a national output of 2,300,000 million kWh by 1980.

Preference, he stated, would be given to the erection of thermal stations (especially those using oil and natural gas) because of the less time taken in their construction and the lower capital expenditure entailed in comparison with hydro stations. The new thermal stations, probably about 2½ million kW each, would be situated near cheap sources of fuel in the eastern parts of the U.S.S.R., which by 1965 are expected

to be responsible for 46 per cent of total generation in the country. Electrification was considered to be one of the principal ways of achieving the industrial productivity of the United States of America.

Payment of Outstanding Accounts

In future electricity consumers in Ireland who have not paid their accounts will be able to avoid disconnection of the supply if the amount due and a collection charge of 5s are paid to the Electricity Supply Board's representative.

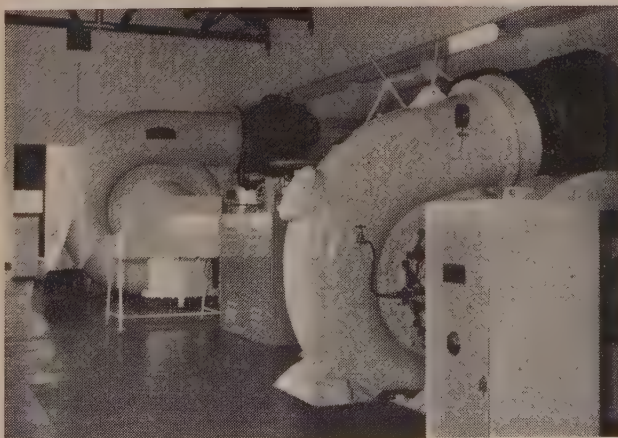
Sudan-Ethiopia Power Scheme

The £4 million Sennar hydro-electric project was initiated on 2nd January by a simple tape cutting ceremony performed jointly by President General Abboud of the Sudan and Emperor Haile Selassie of Ethiopia. The power programme, undertaken by a consortium of the English Electric Co., Ltd., and Siemens-Schuckertwerke of Erlangen, involves the building of a hydro-electric station with two English Electric 7.5 MW Kaplan water turbine sets at the existing dam at Sennar, on the Blue Nile; the extension of the Burri power station in Khartoum by installing a 10 MW English Electric steam turbo-generator; and the erection of an overhead transmission line to connect Sennar with Khartoum, with intermediate substations at Wad Medani and Hassa Heissa.

New Tanganyika Power Station

A hydro-electric power station built by the Tanganyika Electric Supply Co. in the Southern Highlands province was officially inaugurated on 11th December by the Governor, Sir Richard Turnbull, K.C.M.G. The station is situated on the Little Ruaha River, some 15 miles from Iringa, and replaces a small hydro unit which has supplied the area for the last 10 years. Two Gilbert Gilkes & Gordon turbines, directly coupled to their respective alternators, give a combined capacity of 1,220 kW under a head of 127ft and flow requirement of 140 cusecs. Generation is at 3,300 V stepped up to 11 kV for the outgoing feeders.

View of the turbines at the Iringa hydro-electric station, Tanganyika



A.E.I. (Woolwich) Ltd.

AS already announced, on 1st January Siemens Edison Swan, Ltd., changed its name to Associated Electrical Industries (Woolwich), Ltd. The new company is responsible for managing four new Product Divisions of Associated Electrical Industries, Ltd. These are:—A.E.I. Telecommunications Division; A.E.I. Radio and Electronic Components Division; A.E.I. Cable Division; and A.E.I. Construction (Cables and Lines) Division. In addition, the following companies are now grouped under the management of Associated Electrical



Dr. J. N. Aldington



Mr. S. E. Goodall

Industries (Woolwich), Ltd.:—The London Electric Wire Co. & Smiths, Ltd.; A.E.I. Plastics (Aldridge), Ltd. (formerly Aldridge Plastics, Ltd.); Henley Foundries, Ltd.; and the Fixed Price Light Co., Ltd.

The board of directors of A.E.I. (Woolwich), Ltd., is:—**Lord Chandos** (chairman); **Mr. J. N. Aldington**, B.Sc., Ph.D., M.I.E.E., F.R.I.C., F.Inst.P., F.I.E.S. (group managing director); **Mr. T. E. Allibone**, Ph.D., D.Sc., F.R.S., M.I.E.E., F.Am.I.E.E., F.Inst.P., director of research (formerly director of research, Siemens Edison Swan, Ltd.); **Mr. L. S. Crutch**, B.Sc.(Eng.), M.I.E.E., director of engineering, telecommunications (formerly director of engineering, telecommunications and cable, Siemens Edison Swan, Ltd.); **Mr. G. W. Griffin**, M.B.E., F.B.I.M., director of manufacture (formerly director of manufacture, telecommunications and cable, Siemens Edison Swan, Ltd.); **Mr. J. T. Thornhill**, M.I.E.E., director of manufacture (formerly director of manufacture, radio, Siemens Edison Swan, Ltd.); **Mr. B. A. Hensler**, director, export (formerly director of export,



Mr. W. G. Patterson



Mr. C. C. McCallum

Siemens Edison Swan, Ltd.); **Mr. J. W. Ridgeway**, commercial director (formerly commercial director and director of radio, Siemens Edison Swan, Ltd.); **Mr. A. Whitaker**, O.B.E., M.A., M.I.E.E., F.Inst.P., director of engineering, radio (formerly director of engineering, radio, Siemens Edison Swan, Ltd.); **Mr. S. E. Goodall**, M.Sc.(Eng.), M.I.E.E., F.Q.M.C., director of engineering, cable (formerly director and chief engineer of W. T. Henley's Telegraph Works Co., Ltd.); **Mr. R. L. Basset** (formerly director of Siemens Edison Swan, Ltd.); and **Mr. A. F. Street** (formerly director of Siemens Edison Swan, Ltd.). The secretary of the company is **Mr. S. W. Lumb**, F.A.C.C.A., formerly secretary, Siemens Edison Swan, Ltd. He is a director of the Fixed Price Light Co.

Of the four new Divisions, the Telecommunications Division was previously a Product Division of Siemens Edison Swan, Ltd. A.E.I. Cable Division and A.E.I. Construction (Cables and Lines) Division combine the interests of the former Siemens Edison Swan Cables Division, Liverpool Cables, Ltd., and W. T. Henley's Telegraph Works Co., Ltd. The Radio and Electronic Components Division will cover all the other activities of the former Siemens Edison Swan Co.

The executive structure of the four new Product Divisions is as follows:—

Telecommunications Division

General manager, **Mr. W. G. Patterson**, M.B.E., F.B.I.M. (formerly director of A.E.I. Divisional Management Co., Ltd., and general manager of Siemens Edison Swan Telecommunications Division); manufacturing manager, **Mr. J. M. Wilcox** (formerly manufacturing manager, Siemens Edison Swan Telecommunications Division); chief engineer, **Mr. F. G. Pheazey**, A.M.I.E.E. (formerly chief engineer, Siemens Edison Swan Telecommunications Division); production engineering manager, **Mr. T. J. Scudder**, A.M.I.Prod.E. (formerly production engineering manager, Telecommunications Division, Siemens Edison Swan, Ltd., and works manager of the Hartlepool and Spennymore factories); and commercial manager, **Mr. D. J. Green**, A.M.I.E.E. (formerly commercial manager, Siemens Edison Swan Telecommunications Division).

Radio and Electronic Components Division

General manager, **Mr. C. C. McCallum**, A.M.I.E.E. (formerly sales manager, valves, cathode ray tubes and semiconductors, Production Departments 14 and 15, Siemens Edison Swan, Ltd.); manufacturing manager, **Mr. A. G. Everett** (formerly general works manager, valve and cathode ray tube factories, Siemens Edison Swan,



Mr. J. S. A. Bunting



Mr. E. J. Vidler

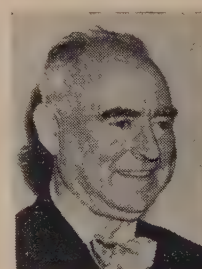
Ltd.); engineering manager (development), **Mr. J. Donegan**, B.Sc., A.C.G.I., D.I.C. (formerly chief engineer, valves and cathode ray tubes, Siemens Edison Swan, Ltd.); engineering manager (consultative), **Mr. C. L. Hirshman**, A.C.G.I., D.I.C., S.M.I.R.E. (formerly chief consulting and applications engineer, Siemens Edison Swan, Ltd.); and sales manager, **Mr. P. V. Lister** (formerly responsible for "Setmaker" sales (valves and cathode ray tubes), Siemens Edison Swan, Ltd.).

Cable Division

Joint general managers, **Mr. J. S. A. Bunting**, M.C., Associate I.E.E. (formerly commercial director, cable, Siemens Edison Swan, Ltd.) and **Mr. E. J. Vidler** (formerly general manager and director, W. T. Henley's Telegraph Works Co., Ltd.); manufacturing managers, **Mr. V. L. J. Plascott** (formerly manufacturing manager, Cables Division, Siemens Edison Swan, Ltd.) and **Mr. S. J. Wilson** (formerly general works manager, Gravesend, W. T. Henley's Telegraph Works Co., Ltd.); chief engineers, **Mr. W. G. Hawley**, A.M.C.T., A.I.E.E. (formerly chief engineer, Cables Division, Siemens Edison Swan, Ltd.) and **Mr. J. H. Savage**, M.I.E.E., M.I.W.M. (formerly works manager, North Woolwich Works, W. T. Henley's Telegraph Works Co., Ltd.); sales manager, **Mr. H. D. Parsons** (formerly general sales manager of W. T. Henley's Telegraph Works Co., Ltd.); commercial manager, **Mr. F. V. Vaissiere**, B.Com., A.C.W.A., Companion I.E.E. (formerly assistant general manager, W. T. Henley's Telegraph Works Co., Ltd., director of Henley Foundries, Ltd.).

Construction (Cables and Lines) Division

General manager, **Mr. A. V. Burnett**, Associate I.E.E. (formerly contract manager, W. T. Henley's Telegraph Works Co., Ltd.); chief engineer, **Mr. W. Sim** (formerly manager, Outside Contracts Department, Siemens Edison Swan, Ltd.); commercial manager, **Mr. L. F. Capeling**, M.I.E.E. (formerly deputy contracts manager of W. T. Henley's).



Mr. A. V. Burnett

The “Electrical Review” and You

*A personal invitation from the
managing editor and director . . .*

The "Electrical Review" and You

Dear Reader,

In recent years the electrical industry has expanded greatly both in size and scope, and the speed of technical advance has also tended to make it less homogeneous. The leading position of the *Electrical Review* is an important assurance that we are catering effectively each week for the divergent interests of those employed in the industry—and their customers. But we are not complacent. If you will help me by answering some or all of the questions set out on the opposite page we shall be in a better position to decide if any changes in content and arrangement might make it even more useful and interesting.

If you do not wish to give your name and address your replies will still be welcome.

Simply remove and fold the questionnaire as indicated. No stamp is needed in the United Kingdom, but if you live overseas please enclose the form in a stamped envelope. Unfortunately, there is no international business reply service.

Please write your answers under each question, or place a (✓) in the appropriate space.

Aug. 20. 1893

Managing Editor and Director

If the Questionnaire has been removed by a previous reader we shall be pleased to send you a further copy

"ELECTRICAL REVIEW" QUESTIONNAIRE

Please write your answers under each question, or place a ✓ in the appropriate box

1. Do you read ELECTRICAL REVIEW:	Regularly? <input type="checkbox"/>	Occasionally? <input type="checkbox"/>	For office use only.						
2. Do you usually:	Buy your own copy? <input type="checkbox"/>	Have it supplied in the course of your work? <input type="checkbox"/>	Have it passed on from someone else? <input type="checkbox"/>						
3. How many people, including yourself, read your copy? people		xx						
4. How long have you been a reader of ELECTRICAL REVIEW? years		xx						
5. Please list other journals in the electrical and allied fields which you read regularly			y	x	o				
			1	2	3				
			4	5	6				
			7	8	9				
6. What is the business of the Company or organisation to which you belong?			y	x	o				
			1	2	3				
			4	5	6				
			7	8	9				
7. If you are engaged in the electrical industry, please state what branch:									
Supply (Generation and Distribution)	<input type="checkbox"/>	Retail	<input type="checkbox"/>	1	4				
Manufacturing	<input type="checkbox"/>	Contracting	<input type="checkbox"/>	2	5				
Wholesale	<input type="checkbox"/>	Other	<input type="checkbox"/>	3	6				
8. What are your duties?									
Director or senior executive	<input type="checkbox"/>	Sales, Administration	<input type="checkbox"/>	1	4				
Research, development, design	<input type="checkbox"/>	Operation, Maintenance	<input type="checkbox"/>	2	5				
Production, Inspection	<input type="checkbox"/>	Student	<input type="checkbox"/>	3	6				
		Other	<input type="checkbox"/>		7				
9. What is your age group?			y						
		Under 30	<input type="checkbox"/>	x					
		30-50	<input type="checkbox"/>	o					
		Over 50	<input type="checkbox"/>						
10. Have you technical qualifications? If so, are they:			2						
		Professional	<input type="checkbox"/>	3					
		Other	<input type="checkbox"/>						
11. When do you see your issue of ELECTRICAL REVIEW?									
		On publication	<input type="checkbox"/>	4					
		Week of publication	<input type="checkbox"/>	5					
		Later	<input type="checkbox"/>	6					
12. Please mark in order of preference (1, 2, 3, etc.) those items in ELECTRICAL REVIEW that you find most useful:			1	2	3	4	5	6	
General news of the industry	<input type="checkbox"/>		1	2	3	4	5	6	7
Editorial Comment	<input type="checkbox"/>		1	2	3	4	5	6	7
Personal and Social News	<input type="checkbox"/>		1	2	3	4	5	6	7
Technical Articles	<input type="checkbox"/>		1	2	3	4	5	6	7
Information on new products	<input type="checkbox"/>		1	2	3	4	5	6	7
Financial and commercial information	<input type="checkbox"/>		1	2	3	4	5	6	7
Advertisements	<input type="checkbox"/>		1	2	3	4	5	6	7
13. Are there any new features you would like to see included?			y	x	o				
			1	2	3				
			4	5	6				
			7	8	9				
14. Have you any comments or suggestions which would add to the usefulness of ELECTRICAL REVIEW to you?									

Name:

Address:

.....

THE ANSWERS GIVEN ON THIS FORM WILL BE TREATED AS CONFIDENTIAL

TUCK IN THIS FLAP

FOLD

FOLD

Postage
will be
paid by
ELECTRICAL
REVIEW
PUBLICATIONS
LTD.

No postage stamp
necessary
if posted in
Great Britain
or
Northern Ireland

BUSINESS REPLY FOLDER
Licence No. S.E.877

ELECTRICAL REVIEW PUBLICATIONS, LTD.,
DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.
ENGLAND

FOLD

FOLD

PERSONAL AND SOCIAL

News of Men and Women of the Industry

In addition to the New Year Honours given in our last issue, the following awards have been made:—

In the Rhodesia and Nyasaland List, **Mr. D. L. Anderson**, O.B.E., T.D., chairman of the Federal Power Board, is created a Knight Commander of the Order of the British Empire (K.B.E.) and **Mr. T. K. A. Douglas**, B.Sc., A.M.I.E.E., becomes an Officer of the Order (O.B.E.) for services rendered in connection with the Kariba Dam.

The New Zealand List includes **Mr. C. A. McFarlane**, Director-General, Post and Telegraph Department, who is appointed a Commander of the Order of the British Empire (C.B.E.) and in the Ghana List **Mr. F. E. B. Clark**, Director of Posts and Telecommunications, becomes an Officer of the Order (O.B.E.).

Mr. F. V. Weller, works engineer of Klaxon, Ltd., was awarded the M.B.E.

Mr. A. E. Gregg, Associate M.C.T., Associate I.E.E., has been appointed a director and general manager of Crompton Parkinson (Chelmsford), Ltd. **Mr. A. V. Sowman**, M.I.E.E., managing director, remains in that capacity.



Mr. A. E. Gregg

Mr. Gregg has been with the Crompton Parkinson group since 1936 and for the past year has been general manager at the Guiseley Works. Before that he was product manager for motors at Guiseley and was also general manager of the Overseas Works Division, in which capacity he travelled extensively in the Commonwealth and North America, visiting the group's manufacturing plants overseas. He has twice been chairman of the Crompton Parkinson, Ltd., junior board.

Mr. E. E. Hewett has been appointed sales engineer of Nash & Thompson, Ltd. He was previously a specialist in ultrasonic flow detection techniques with Cossor Instruments, Ltd.

A.E.I.-Hotpoint, Ltd., has announced a number of new appointments. **Mr. B. A. Winship**, M.A.(Cantab.), has been appointed product planning manager. He joined A.E.I.-Hotpoint, Ltd., in December, 1956, as marketing assistant, small appliances, and went to the home laundry group in 1958 as assistant marketing manager.

Mr. H. W. Thompson has been appointed refrigeration marketing manager. He joined Hotpoint in 1957

as manager, south eastern district, was appointed southern division sales manager in 1957 and marketing manager, home laundry, in August last year.

Mr. G. A. Williams, Associate I.E.E.,

A.S.M.A., who has been appointed technical services manager, served a special apprenticeship with the British Thomson-Houston Co., Ltd., with whom he subsequently held various positions on motor design in the engineering laboratory and finally was home laundry appliance design engineer. Transferring to A.E.I.-Hotpoint at Peterborough he became commercial manager in 1953 and was appointed technical sales promotion manager at the head office in 1956.

Mr. J. Parkin, B.A.Hons. (Classics), University College, London, who has been appointed sales promotion manager, joined the company in 1956 as assistant marketing manager, home laundry, and was appointed assistant marketing manager, refrigerator group, in 1957. He became marketing manager, refrigerators, in 1957.

Mr. G. H. Beales, appointed service division manager, joined A.E.I.-Hotpoint in 1956 as sales office manager and was appointed manager, sales administration, in 1957.

Mr. H. R. Johnson has been appointed manager of the company's Newcastle-upon-Tyne district office in succession to **Mr. P. C. N. Browne**, who retired on 31st December. Mr. Johnson joined the company in 1946 and held many positions in the Manchester district office until, in January, 1957, he became a salesman, covering the Merseyside and North Wales area. Later that year he moved to a supervisory position which he held until 1958, when he was appointed northern division assistant at London headquarters.

At a farewell dinner recently Mr. Browne was presented with an



Mr. B. A. Winship



Mr. H. W. Thompson



Mr. G. A. Williams

engraved silver cigarette case by colleagues in the northern division. Mr. Browne joined Hotpoint in 1934 as branch manager, Newcastle office, a position he had held for the past twenty-five years.

Mr. J. D. Lake, general sales manager of A.E.I.-Hotpoint, Ltd., since 1st July last, has been appointed sales director.

The A.E.I. Motor and Control Gear Division announces the following managerial appointments:—**Mr. E. G. Crossling**, assistant divisional manufacturing manager; **Mr. B. Pringle**, M.B.E., consultant and manager, Industrial Applications Engineering Department; **Mr. D. G. Smith**, B.Sc.(Eng.), A.M.I.E.E., manager, Small Industrial Machines Engineering Department (Blackheath); **Mr. J. H. Cribb**, A.M.I.Prod.E., superintendent, control gear and Ardoloy factories; **Mr. F. L. Fletcher**, B.Sc.(Eng.), M.I.E.E., manager, Fractional H.P. Machines Engineering Department, Newcastle (Staffs.); and **Mr. J. Titterton**, M.I.E.E., manager, Large Industrial Machines Engineering Department (Manchester).

Mr. Crossling has been manager of the Coventry works since 1955, a position he still retains by virtue of his appointment as manager of the Coventry works and the Thorne, Colne and West Chirton factories.

Mr. Pringle joined the B.T.H. Co. in 1914 and when the Motor Engineering Department was formed at the Rugby works, in 1949, he was appointed manager.

Mr. Smith joined the Test Depart-



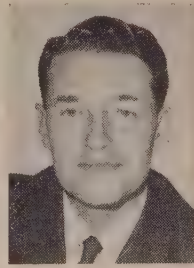
Mr. J. Parkin



Mr. G. H. Beales



Mr. H. R. Johnson



Mr. J. D. Lake



Mr. E. G. Crossling



Mr. B. Pringle



Mr. D. G. Smith



Mr. J. H. Cribb



Mr. F. L. Fletcher



Mr. J. Titterton

ment at the B.T.H. Rugby works in 1916 and became assistant manager, Motor Engineering Department, Birmingham Group, in 1955.

Mr. Cribb joined the B.T.H. Co. in 1935 as a draughtsman in the press tool drawing office and held various positions before being appointed superintendent, control gear factory, in June last year.

Mr. Fletcher joined the B.T.H. Co. as an engineering apprentice in 1927, subsequently entering the A.C. Engineering Department, B.T.H. Rugby Works, in 1932 and, after various appointments, became assistant manager of the Fractional Horsepower Group of the Motor Engineering Department in 1955.

Mr. Titterton joined the Metropolitan-Vickers Electrical Co., Ltd., as a trade apprentice in 1920, on completion of which he joined the M-V Motor Engineering Department. He held a number of positions before being appointed chief engineer of the Department in April last year.

Mr. J. E. A. Heale, formerly works manager of the Motherwell works of Metropolitan-Vickers (now A.E.I. (Manchester), Ltd.), has joined Associated Electrical Industries (Woolwich), Ltd., as general manager of works.



Mr. J. E. A. Heale

Over 600 children of employees of E. K. Cole, Ltd., enjoyed a Christmas party in the Ekco canteen on 9th January. They received gifts and after community singing and the traditional tea there was an entertainment.

Mr. D. A. Rayner, F.A.C.C.A., has been appointed deputy chief accountant of the Eastern Electricity Board in succession to Mr. F. S. Grindrod, who is now the chief accountant.

Mr. Rayner joined the Board in 1948 and has been an assistant chief accountant since that date. Previously he held various accountancy posts with the Northmet Power Co. and was a senior accountant at the time of nationalisation. Since 1954 Mr. Rayner has also carried out the duties of organisation and methods officer. He will continue to be responsible for

the development of this work and its co-ordination throughout the organisation.

Mr. W. E. Spurling, for the past nine years general manager of the Bermuda Electric Light Co., has retired. He is succeeded by Mr. L. Vorley. Mr. Spurling has been with the company for forty-eight years. He will continue to act as secretary-adviser to the board of directors, of which he is a member.

Mr. C. R. Nicholson, who has been secretary of the Swansea and West Central Area of the South Wales Electricity Board since 1948, retired on 31st December after nearly thirty-eight years of service in the electricity supply industry. He joined the staff of the former Electricity Department of the Swansea Corporation in 1922 and after serving in various administrative capacities he became chief commercial assistant to the engineer and manager of the Department in 1942 and held this appointment until the industry was nationalised in 1948.

Mr. D. G. Jones, who has been appointed to succeed Mr. Nicholson, commenced his service in the supply industry in the Swansea Electricity Department in 1936. From 1948 he served in various administrative capacities with the South Wales Board until 1951 when he was appointed principal assistant (personnel) with the Eastern Electricity Board at Ipswich. In May, 1957, he took up a similar appointment at the head office of the South Wales Board at St. Mellons, Cardiff.

Cockburns, Ltd., announce that the following managerial appointments have been made:—Mr. L. W. Noble, formerly manager of North Shields branch works, becomes manager, London office, and Mr. W. A. Duckworth has been appointed as manager of a new office which has been opened in Manchester to serve, particularly, the chemical processing industry.

Mr. C. R. B. Townsend, M.A., A.C.A., secretary of Belling & Lee, Ltd., has been appointed to the board of executive directors.

The Metallurgical Equipment Export Co., Ltd., announces that Mr. D. F. Campbell, who was formerly chairman, has been appointed president, and the chairmanship will be held in rotation by the managing directors of the companies constituting the consortium. Mr. R. B. Potter has

been appointed chairman for the next two years, with Mr. P. Wrightson, O.B.E., as deputy chairman for the same period.

Mr. T. H. Clarke, formerly sales manager of Patterson Lamps (1953), Ltd., Gateshead-on-Tyne, has been appointed general manager.

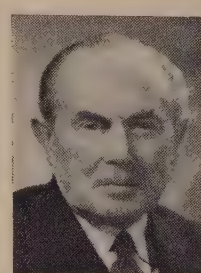
Southern Areas Electric Corporation, Ltd., announces board appointments in two of its subsidiary companies. Mr. S. H. Tombs, general manager of Globelite Industries, Ltd., has been elected to the board of that company, and Mr. J. Airlie, general manager of Carrick Engineering (Stewarton), Ltd., has been elected to the board of that company.

Atlas Lighting, Ltd., announces the reorganisation of its research and development facilities, involving the formation of a Lighting Development Group under the control of Mr. H. Hewitt, A.M.I.E.E., F.I.E.S., at present assistant technical sales manager at the head office at Thorn House. The Group will be based on the Atlas Lighting Laboratories at Enfield, under Dr. J. W. Strange, and will be concerned with the application of light sources and the development of lighting techniques. Mr. Hewitt is well known as a lecturer on lighting matters and is the author of "Modern Lighting Technique" and a number of papers. He has also acted as hon. editor of the *Transactions* of the Illuminating Engineering Society for the past three years.

The company has also retained Mr. H. C. Weston, O.B.E., F.I.E.S., as consultant on light and vision. Mr. Weston recently retired from the staff of the Medical Research Council. He is a past-president of the I.E.S. and has made a special study of lighting requirements for workers and is a world authority on lighting and visual performance. He is the author of



Mr. H. Hewitt



Mr. H. C. Weston

"Sight, Light and Efficiency" and is the British member of the International Illumination Committee of experts on lighting and visual performance; he was leader of the British delegation of the 1959 meeting of the Commission in Brussels.

Mr. G. C. Derbyshire, A.M.I. Mech.E., A.M.I.Prod.E., A.M.I.W.M., has been appointed works and technical director of the Jacobs Manufacturing Co., Ltd., and Frank Guylee & Son, Ltd.

Mr. W. G. Holliday relinquished his appointment as group publicity



Mr. W. G. Holliday

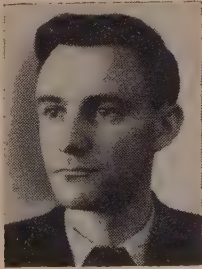
manager with Lancashire Dynamo to take up a new position on 1st January with Howard Pantan, Ltd., advertising agents. Mr. Holliday joined Lancashire Dynamo from the Metal Box Co. at the end of 1950, following earlier experience in advertising agencies. He was elected a Fellow of the Incorporated Advertising Managers' Association in 1959 and is a member of the Institute of Public Relations.

Mr. F. J. Cox has been appointed resident technical representative of D. Napier & Son, Ltd., in South-East Asia. The area which Mr. Cox will cover comprises Burma, Borneo (including British North Borneo, Brunei and Sarawak), Indonesia, the Federation of Malaya, Singapore and Thailand. He will devote part of his time to acting as technical representative in Burma for the English Electric Co., Ltd.

Mr. O. E. Mainer, M.Sc.Tech., A.M.I.E.E., joint author of the article on "Induction Motor Losses" (page 103), joined the South East Technical Institute as a lecturer in 1939, having spent several years in industry. Subsequently he was lecturer responsible for electrical engineering at the Municipal Technical College, Bolton, and then at the R.A.E. Technical College, Farnborough, before becoming principal lecturer in electrical engineering at the Royal Military College of Science, Shrivenham, in 1948. From 1952 to 1954 he was



Mr. O. E. Mainer



Mr. J. R. Edwards

granted leave of absence to become Professor of Electrical Engineering at the College of Engineering, Baghdad.

Mr. J. R. Edwards, D.F.H., Graduate I.E.E., his co-author, was educated at Ilminster Grammar School and Faraday House. He received his practical training with Westland Aircraft, Ltd., and Brook Motors, Ltd., and served with R.E.M.E. from 1952 to 1955. He then worked as research assistant with Brook Motors, Ltd., and was appointed to his present position as experimental officer at the Royal Military College of Science in 1957.

Associated Electrical Industries, Ltd., has appointed **Sir Arthur Elton**, Bt., to be the controller of its Central Information Department. He will take up his duties on 1st March. Sir Arthur has for the last three years been in charge of films and television in the Public Relations Division of the Shell International Petroleum Co.

Mr. S. C. Leslie, who was appointed a year ago as A.E.I. consultant on information policy, has been acting for the past six months as the head of the Central Information Department during the process of its establishment. After Sir Arthur Elton's arrival he will be free to resume his consultancy duties in the wider field of both external and internal policy on information.

Mr. W. H. Longley has been appointed director and chief accountant of Simms Motor Units, Ltd. He has been the company's chief accountant since 1958.



Mr. W. H. Longley

The appointment is announced by Simms Motor Units, Ltd., principal operating company in the Simms group of companies, of **Mr. D. E. Pierce**, A.M.I.E.E., Dip.M.I.E.S., to the position of controller—material purchases, in which capacity he will co-ordinate all material purchases by the Simms group of companies.

Mr. R. B. Richardson, D.P.A., A.M.I.E.E., has been appointed commercial officer of the Chilterns Sub-Area of the Eastern Electricity Board, in succession to **Mr. R. T. Hows**, who was not able fully to take up his recently announced appointment to this post for personal family reasons. Mr. Hows has been seconded to the Commercial Department in the Northmet Sub-Area.

Mr. Richardson, who has been the commercial officer for the Fens Sub-Area since 1952, entered the electricity supply industry with Edmundsons Electricity Corporation and in 1939 he became electrical engineer to the Kent County Council. In 1946 he was appointed installation superintendent and consumers' engineer with the Hull

Electricity Department. He was commercial officer of the Hull Sub-Area from 1948 to 1952.

Mr. R. Beard, retired in November last after twenty-five years' service with Black & Decker, Ltd., as purchasing manager. At a farewell party given in his honour at the Chequers Hotel, Colnbrook, Mr. Beard was presented with a television set by the directors, as well as with several other gifts from his own department and colleagues.



Mr. R. Beard

Mr. C. Robertson King, president, was in the chair at last Tuesday's luncheon meeting of the **Electrical Industries Club**, at which the guest speaker was the Earl of Verulam. Lord Verulam, who recently concluded a tour of China, spoke of his experiences there, under the title "A Peep Behind the Bamboo Curtain." In a fascinating and informative address he described life and trade conditions in present-day China and stressed the country's importance in the world of trade. The possibilities of trade between Britain and China were immense, for reasons of tradition no less than because of the complementary nature of our economies. He concluded by saying that the trade door was ajar and it was up to us to open it. The next meeting will be on Tuesday, 9th February.

Marconi International Award

The establishment of an annual award in memory of Guglielmo Marconi is announced by Permindex, the World Trade Centre in Rome. This award will be made to the individual making the greatest contribution to the development of Marconi's discoveries. Recipients will be chosen by a committee composed of international personalities, a member of the Marconi family and representatives of Permindex. This announcement followed the recent dedication of the Marconi obelisk, to be known as the Marconi Antenna, in the Piazza Italia. To celebrate the occasion the square itself was renamed Piazza Guglielmo Marconi. The prize consists of a small reproduction in gold of the obelisk to be executed by Commendatore Ventrella, Italy's leading jeweller, under the supervision of Arturo Dazzi, the sculptor of the obelisk.

Electricity Supply Aids Research

The Electricity Supply Research Council has made a special grant of £7,000 to the University College of Swansea for research apparatus to be used in the Physics Department. The Council already makes an annual grant of £2,300 to the College.

Financial Section

STOCKS and SHARES

THE rate at which the industrial markets of the Stock Exchange began their advance into the new year proved too hot to be maintained. Dealings became less hectic, and profit-taking sales caused many quotations to give up at least a large part of the previous week's gains. Conjecture over the possibility of an increase in Bank Rate has remained as a depressing influence on the gilt-edged market, and as a factor to be taken into account also in considering the low yields on leading industrials, on many of which the return is now a full 2 per cent or more below the rates available from Government securities. Market commentators are agreed that the industrial markets, while remaining firm underneath, will be all the healthier for losing some of their speculative froth.

Reaction

Shares of the major electrical groups were all involved in the general market reaction, but retained nevertheless much of the improvement which has been a feature of the industrial market since the investor's preference began, a month or two ago, to shift towards the capital equipment sides of industry. English Electric shares, which had been in the van of the movement, lost as much as 3s, to 50s, over the week, but in A.E.I. the fall was limited to 1s, at 65s 3d. In G.E.C. at 45s 6d, C. A. Parsons at 56s 9d and A. Reyrolle at 96s the declines were of the order of two shillings. Among the heavy engineering firms associated with these companies, Clarke Chapman produced a bright exception to the trend in adding 4s to the previous week's rise of 3s 6d, reaching 62s 6d, but Babcock & Wilcox, John Thompson, Simon-Carves, Head Wrightson and others were inclined to drift.

Mixed Changes

In the cable manufacturing group, Pyrotex moved strongly against the tide, advancing 5s 3d to 50s, to the accompaniment of undefined rumours concerning impending developments. B.I.C.C., Johnson & Phillips and Reliance Clifton were all about 1s lower. Changes among domestic equipment issues were also mixed, with Morphy-Richards in favour up to 35s, Hoover declining further to £5 and the newly issued Dimplex to 28s 3d. There were declines of over 3s in E.M.I. at 52s 6d and Thorn Electrical at 52s, and of 2s 6d in Decca "A" at 48s. Motor equipment issues were mostly lower, but elsewhere Desoutter and Dupont continued to be well supported; and improvements were marked in

Bowthorpe at 11s 6d and Newman Industries at 4s 9d.

Votes for "A" Shares

While the proposal of the Ultra Electric (Holdings) directors to give

full voting rights to the "A" ordinary shares gives, of course, considerable satisfaction to the holders concerned, it was also acclaimed more widely as a further step towards the general elimination of an increasingly unpopular

Price Changes in

Company or Board	Nom. Value	Middle price 11th Jan.	Week's Rise or Fall	Dividend		Yield %	1959	
				Pre-vious	Last		High-est	Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	79	—½	3	3	3 16 0	81	77½
Brit. Elec. 1974/77	100	76	—½	3	3	3 18 9	78	74½
Brit. Elec. 1976/79	100	79	—½	3½	3½	4 8 3	81	77½
Brit. Elec. 1974/79	100	90	—½	4½	4½	4 14 6	91½	87½
Overseas Electric Supply								
Calcutta Elec.	£1	20/6	+1/-	6-8†	7†	11 2 0	20/-	16/-
East African Power	£1	20/-		7½	8	8 0 0	22/6	19/3
Nigerian Elec.	£1	19/6	+6d	8	8	8 4 3	19/-	13/-
Perak Hydro-Elec.	£1	17/6	+6d	10	5	5 14 3	17/-	12/3
Electrical Shares								
Aberdare Holdings	5/-	17/9		17½	17½	4 18 6	18/9	15/6
Aerialite	1/-	9/3		54	54	5 16 6	12/3	7/9
Allen, W. H.	£1	58/9		11	12	4 1 9	58/9	43/-
Allied Insulators	5/-	23/-		—	20†	4 7 0	23/6	18/9
Anglo-Portuguese Tel.	£1	27/6	-1/-	9	9	6 11 0	30/9	26/6
Aron Elec. Ord.	£1	47/-	+2/-	15	15	6 7 9	62/6	45/-
Assoc. Elec. Ord.	£1	65/3	-1/-	15	15	4 12 0	67/-	53/9
Automatic Tel. & El.	5/-	21/9		17	17½	3 18 0	21/9	18/-
Babcock & Wilcox	£1	46/6	-1/9	13½	13	5 11 9	52/6	43/-
Bakelite	10/-	41/3		15	15	3 12 9	41/3	22/-
Baldwin, H. J.	2/-	2/3		20	—	—	3/-	2/-
Berry's Electric	5/-	31/6	-1/-	10	20½*	3 3 6	33/6	7/3
Bowthorpe Holdings	2/-	11/6	+3d	25	27	2 16 6*	11/3	8/-
British Elec. Traction:								
Def. Ord. "A"	5/-	47/-	-2/6	25	35	3 14 6	49/6	35/6
B.I. Callender's	£1	59/3	-1/3	12½	13½	4 11 3	60/6	44/9
B.I. Callender's 6% Pref.	£1	21/-		6	6	5 14 3	21/-	19/9
British Thermostat	5/-	25/-		30	35	3 10 0*	28/-	18/6
Brook Motors	10/-	58/-	-6d	25	25*	4 6 3	59/6	46/-
Bulgin, A. F.	1/-	13/9		45	50	3 12 9	13/9	6/9
Bulpitts	5/-	21/3		—	15	3 10 6	21/3	10/-
Burco Dean	5/-	15/6	-9d	16	18	5 16 3	19/6	12/3
Cable & Wireless:								
Ord.	5/-	20/-	-9d	10	10*	2 10 0	22/-	12/3
4% Loan	100	96		4	4	4 3 3	96	93
Chloride El. Storage "A"	£1	71/-	-2/-	17½	20½	3 15 0*	73/-	43/8
Clarke Chapman	£1	62/6	+4/-	27½	13½*	4 8 0	66/3	52/6
Cole, E. K.	5/-	26/9	-9d	17½	20	3 14 9	27/6	17/3
Contactar Switchgear	5/-	16/3	+9d	14	14	4 6 3	16/9	12/-
Cossor, A. C.	5/-	9/9	-3d	Nil	5	2 11 3	9/6	6/3
Crabtree	10/-	53/6	-6d	20	20	3 14 9	54/-	28/-
Crompton Parkinson	5/-	14/6	-6d	12	14	3 17 0*	15/-	9/6
Davis & Timmins	5/-	21/6	-3d	18	20	4 13 0	22/-	14/6
De La Rue	10/-	73/6	+2/-	17½	20	2 14 6	71/6	30/3
Decca "A"	10/-	48/-	-2/6	50	20*	4 3 3	50/6	33/3
Desoutter	5/-	38/6	+1/-	25	21½*	2 16 6	37/6	19/-
Dewhurst	2/-	8/3	-3d	20	20	4 17 0	9/6	7/3
Dictograph Tel.	2/-	12/9	-9d	20	20	3 2 9	13/6	7/-
Dimplex	5/-	28/3	-9d	—	25†	4 8 6	30/-	—
Dubilier Condenser	1/-	5/3		20	25	4 15 3	5/6	3/3
Dupont	5/-	29/9	+1/3	12½	17½	2 18 9	28/6	10/3
E.M.I.	10/-	52/6	-3/9	20	14*†	2 18 3	56/6	31/6
Electrical Apparatus	5/-	14/-	-3d	14½	14½	5 3 6	16/6	13/-
Electrical Components	5/-	13/-	+6d	12½	15	3 17 0*	14/-	7/-
Elec. Construction	£1	37/-		8½	9	4 17 3	37/-	27/9
Elliott-Automation	5/-	27/6		—	11-2†	2 0 9	30/6	16/9
Enfield Rolling Mills	£1	56/3		12½	15	5 6 9	60/-	36/9
English Electric	£1	50/-	-3/-	14	14	3 14 9*	52/6	37/10
English Electric 3½% Pref.	£1	13/-	-3d	3½	3½	5 13 3	13/6	12/3
Ericsson Tel.	5/-	27/-	-9d	12†	13†	3 19 0	28/-	22/3
Ever Ready	5/-	28/-	-6d	20	27½†	2 19 0*	28/-	13/3
Falk Stadelmann	£1	35/-		10	10	5 14 3	35/6	25/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

form of capital. It may be remembered that Pye was one of the several other companies which have lately given their "A" shares equal standing with the rest of their ordinary stocks. Ultra Electric 5s "A" shares reacted initially

to the announcement with a rise to 28s 9d, but came back later to 26s. They show a yield of a little over 3½ per cent on the last dividend of 20 per cent for the year 1958-59. An interim distribution on account of

the year ending next March is due to be declared.

Colvern Dividends

Colvern 5s shares, at 39s, held most of the sharp rise which had followed the company's interim report on progress during the current year, ending in March. There is no change in the interim payment, at 10 per cent, but both turnover and profits in the first eight months of the period were said in the statement to have been higher than in the previous corresponding months. In the absence of something unforeseen in the closing part of the year, the directors felt confident that results for the full period would give them an opportunity to increase the final dividend. On the basis of the last total of 27½ per cent, the yield on the shares works out at 3½ per cent. If the higher distribution duly materialises, shareholders will have received an increase in their return for each year since the shares were marketed in 1955.

Brook Motors

In the first half of the company's financial year, ended September, 1959, profits of Brook Motors were sharply affected by the general trade recession, but a considerable improvement materialised during the second six months, and in his review with the recently issued report the chairman described the present demand for the group's products as exceedingly good. He saw every sign that the upward trend would continue, while giving shareholders a warning at the same time about the pressure on profit margins. Although lower than in the previous year, the profits of 1958-59 still gave more than twofold cover for the 25 per cent dividend. It is proposed to distribute a one-for-six scrip issue before the end of this month. At 58s the 10s shares yield a fraction more than 4½ per cent.

I.C.T. Prospects

Sir Cecil Weir was able to give a good account of progress and prospects in the first annual report to be issued by International Computers & Tabulators since the formation of this company as an amalgamation of British Tabulating Machine and Powers-Samas. As known previously, the group profit of £2.3 million (including only nine months' earnings of Powers-Samas) was materially more than the combined profits of the two constituent companies in their last full financial years, and a dividend of 10 per cent has been declared. According to the chairman, the process of integration has been carried through much more quickly than had been anticipated: with a good order book at the beginning of the year, and ample prospects of new business, he expects progress to be well maintained. At 75s 6d—a little below their recent best—the £1 shares offer a yield of a little less than 2½ per cent on a dividend calculated to be covered about twice by earnings.

Electrical Investments

Company or Board	Nom. Value	Middle price 11th Jan.	Week's Rise or Fall	Dividend		Yield %	1959		
				Pre-vious	Last		High-est	Low-est	
Electrical Shares—continued							£	s	d
G.E.C. ...	£1	45/6	−2/-	10	10	4 8 0	48/-	31/3	
G.E.C. 6½% Pref. ...	£1	22/-	−1/-	6½	6½	5 18 3	23/-	20/3	
General Cables ...	5/-	9/-		24	15	8 6 9	9/3	7/6	
Goblin (B.V.C.) ...	5/-	13/9		10	7½*	2 14 6	13/9	4/6	
Greenwood & Batley ...	£1	117/6		20	20	3 8 0	117/6	75/-	
Hackbridge Holdings ...	5/-	17/3	+6d	20	20	5 16 0	19/3	14/3	
Hackbridge & Hewittic ...	5/-	14/9		20	20	5 1 9*	15/6	10/6	
Head Wrightson ...	5/-	28/-	−3/6	20	14½*	2 10 0	31/6	16/6	
Heatrae ...	2/-	9/6		20	20	4 4 3	10/-	7/6	
Holophane ...	5/-	19/6		22½	26	6 13 3	20/-	14/9	
Hoover ...	5/-	100/-	−3/9	50	60	3 0 0	103/9	55/-	
I.C.I. ...	£1	60/-	−1/6	12	8*	2 13 3	61/6	33/-	
Intl. Combustion ...	5/-	46/-	+1/-	25	30½	3 5 3	43/6	29/9	
Intl. Computers & T. ...	£1	75/6	−1/6	—	10	2 13 0	78/9	57/6	
Johnson & Phillips ...	£1	22/6	−1/3	5	5	4 9 0	30/6	18/3	
Lancashire Dynamo ...	£1	65/-	+1/-	11	12½†	—	65/-	31/6	
Laurence Scott ...	5/-	18/6		15	15	3 9 9*	18/9	14/-	
Lister, R. A. ...	£1	54/6	−1/-	12½	14	5 2 9	55/6	32/9	
Lucas, J. ...	£1	73/9	−9d	10	12½	3 7 9	78/6	43/3	
Marconi Marine ...	£1	43/6	+6d	10	10	4 12 0	48/6	40/-	
Marryat & Scott ...	2/-	14/6	−3d	37½	22½*	3 2 0	14/9	8/6	
Mather & Platt ...	£1	52/-		15	10½*	4 2 0	52/-	41/3	
Metal Industries ...	£1	74/6		14	15½	4 0 6	74/6	39/9	
Midland Elec. Mfg. ...	£1	52/6		12½	10*	3 16 3	52/6	41/6	
Morphy-Richards ...	4/-	35/-	+1/3	20	25	2 17 3	34/-	18/-	
Murex ...	£1	75/-	−1/-	17½	15	4 0 0	76/-	42/-	
Newman Ind. ...	2/-	4/9	+9d	10	10	4 4 3	3/6	2/3	
Oldham & Son ...	1/-	2/9		17½	17½	6 7 3	3/3	2/6	
Parsons, C. A. ...	£1	56/9	−2/-	7½	8½†	2 17 0	58/9	45/9	
Philips' Lamps ...	Fl. 10	157/6	−2/6	14	14	1 13 6	160/-	88/-	
Plessey ...	10/-	47/6	−1/-	20	14*†	2 19 0	48/6	23/6	
Pye ...	5/-	18/-	−1/-	12½	12½*†	3 9 6	20/6	13/-	
Pyrotex ...	5/-	50/-	+5/3	—	34	3 8 0	47/6	33/9	
Radiation ...	£1	42/6	−1/3	5	6	2 16 6	43/9	24/9	
Reliance Clifton ...	5/-	26/3	−1/3	15	15	2 17 3	27/6	17/6	
Reyrolle ...	£1	96/-	−2/6	17½	17½	3 13 0	98/-	85/9	
Rheostatic ...	4/-	18/6		20	20½	4 6 6	18/6	8/3	
Richardsons Westgarth ...	10/-	14/-	−9d	8½	8½	5 19 0	15/3	11/6	
Simon-Carves ...	5/-	36/3	−1/3	25	25	3 9 0	37/6	28/6	
Smith (England), S. ...	4/-	19/3	−9d	12½	17½	3 12 9	21/-	11/6	
Southern Areas ...	£1	14/9		Nil	Nil	Nil	15/-	10/6	
Strand Elec. ...	5/-	20/-	+9d	15	20	5 0 0	19/3	8/6	
Sturtevant ...	5/-	23/-		15†	15†	5 6 6	23/6	17/-	
Sun Elec. ...	5/-	15/9		25	15*	4 15 3	16/9	8/3	
Switchgear & Cowans ...	5/-	16/-	−6d	22½	15*	4 13 9	16/6	10/3	
T.C.C. ...	10/-	57/6		25	25	4 7 0	58/6	38/-	
Telephone Mfg. ...	5/-	7/3	+3d	10	10	6 18 0	7/3	4/9	
Telephone Rentals ...	5/-	19/6		12½	12½*	3 4 0	22/6	11/9	
Thompson (John) ...	5/-	24/6	−1/6	25	25	5 2 0	25/6	19/6	
Thorn Elec. ...	5/-	52/-	−3/6	17½	20	1 18 6	56/3	26/3	
Thornycroft ...	£1	29/3	−2/3	7½	6	4 2 0	31/6	20/6	
Tube Investments...	£1	135/6	−3/6	17½	20	2 19 0	138/-	71/6	
Vactric ...	5/-	42/6		25	37½	4 8 3	46/6	26/3	
Walsall Conduits ...	4/-	15/9		22½	22½	3 5 0*	15/9	10/8	
Ward & Goldstone ...	5/-	57/6	−1/3	25	30	2 12 3	58/9	30/6	
Watford ...	2/-	12/-	+6d	25	25*	4 3 3	14/9	7/6	
Westinghouse ...	£1	59/-		10	10	3 7 9	59/-	39/6	
West, Allen ...	5/-	15/-	−6d	12½	11½*	3 17 6	15/6	11/9	
Wolf Electric ...	5/-	11/9		10	10	4 5 0	11/9	7/9	

REPORTS and DIVIDENDS

Burco Dean, Ltd.—The accounts of this company for the year ended 30th September last were dealt with in our issue of 25th December.

In his review of the year, which has been circulated to shareholders, Mr. D. K. Ward (chairman) says that in his statement last year he referred to the end of the credit squeeze having a beneficial effect upon the order book. This condition, however, did not persist throughout the whole of the financial year and there was a marked fall in the demand for some of their products in the last few months of the year. The Gas Division has suffered more than the Electrical Division, due mainly to the ready availability on extended credit of expensive electrically powered home laundry appliances. The board has long realised that gas-heated laundry appliances have not the same consumer appeal as their electrical counterparts, and whilst supporting the Division with ample publicity, the board has not expended capital on buildings, plant and machinery on this side of the business. To economise on production, one factory, H. Slack & Sons, Ltd. (Gas Division), has been closed down.

A development programme for new products for the Electrical Division has been pursued with vigour over the last few years. A new combination washing machine and spinner is now being distributed to the trade and will be launched with a strong advertising campaign in March in the London area. The launching of new products in a very competitive market is expensive and results from the point of view of profit earning are never immediate. Mr. Ward says that the removal of all production processes and plant to new premises is an expensive and tedious business. The alternative, however, was to extend existing factories, which would have been more expensive in capital cost and not as satisfactory for economy of manufacture.

These factors of removal and heavy advertising expenses have influenced the board against any substantial increase in dividend despite the large increase in net profits. Mr. Ward emphasises that the profits for 1960 will be substantially reduced and this influenced the directors in recommending the final dividend. After referring to the company's factory developments as a prelude to expansion, Mr. Ward says that last year he told shareholders that he did not rule out the possibility of seeking further capital by an issue of shares in order to finance expansion. Some of that expansion has already taken place but the bulk of it will not materialise for at least a further twelve months. In all the circumstances, the board considers that present capital needs can be financed by their bankers and their own resources, so that it

would be premature to raise further capital at this juncture. Before further capital is sought a revaluation of properties will be carried out. The reasons for this, he states, are that an adequate depreciation shall be charged (and thus a capital reserve created) and secondly that the shareholders shall have a true picture of the company's fixed assets.

Ultra Electric (Holdings), Ltd., announces that it proposes to recommend to the ordinary stockholders that the "A" ordinary stock be converted into an equivalent amount of ordinary stock. As compensation to the ordinary stockholders it is proposed to recommend that they receive one ordinary stock unit for every twenty units held. It is proposed that the additional shares to be issued will rank for all dividends that may be declared in respect of the current financial year. It is announced that the trading of the group will be carried on by two subsidiary companies. Ultra Electronics, Ltd., will be concerned with the activities formerly carried out by the Special Products Division, and Ultra Radio & Television, Ltd., will be concerned with domestic radio and television and have as its subsidiary, Pilot Radio & Television, Ltd.

Mr. E. E. Rosen, chairman and managing director of Ultra Electric, Ltd., and Ultra Electric (Holdings), Ltd., will continue as chairman of the holding company and of the subsidiary companies. Mr. A. V. Edwards, who has been assistant managing director during the past 18 months, has been appointed managing director of the holding company and of the subsidiaries. Other members of the subsidiary boards will be:—Ultra Electronics, Ltd.: Mr. L. R. Crawford (general manager), Dr. F. W. Stoneman (chief engineer), Mr. J. S. Williams (works manager), Mr. E. R. Wright (commercial manager). Ultra Radio & Television, Ltd.: Mr. T. C. Standeven (general manager), Mr. A. Bamford (technical manager), Mr. W. H. De Val (works manager). Mr. T. C. Standeven is also on the board of Pilot Radio & Television, Ltd., and Mr. J. Irving will continue as secretary of the holding company and the subsidiaries.

Ether Langham Thompson, Ltd.—At an extraordinary general meeting of Ether, Ltd., held on 1st January a resolution was passed changing the name of the company to Ether Langham Thompson, Ltd. This change follows the acquisition of the entire share capital of the J. Langham Thompson Group, Ltd. Mr. J. Langham Thompson and Rear-Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O., have joined the board of the company. Concurrently a new company, Ether, Ltd., has been formed as a wholly-owned subsidiary to carry

on the business hitherto carried on by the company. The group now consists of the company, as parent, owning the entire issued share capital of Ether, Ltd., Electro Methods, Ltd., and the J. Langham Thompson Group, Ltd.

Marco Refrigerators, Ltd., reports that after providing £10,400 for taxation, the net profit for the year ended 30th September last is £22,239, as compared with £26,423 for the preceding year. It is proposed to pay a final dividend of 8½ per cent, maintaining the distribution for the year at 11 per cent. The directors state that a great deal of the company's activities have been devoted to the design and preparation of a number of new models, large sales of which are expected in the forthcoming season.

Kenwood Manufacturing-Peerless & Ericsson.—At an extraordinary meeting to be held on 28th January it is proposed to change the name of the parent company, Peerless & Ericsson, Ltd., to the Kenwood Manufacturing Co., Ltd. This follows the completion of the merger of the two businesses. Subject to shareholders' approval at the meeting the name of the Kenwood Manufacturing Co. will be quoted on the Stock Exchange from 28th January in place of Peerless & Ericsson.

Courtaulds' Pinchin Johnson Offer.—Courtaulds, Ltd., is to make an offer for the ordinary capital of Pinchin Johnson & Associates, Ltd., on the basis of two Courtaulds £1 ordinary shares for every three 10s ordinary shares of Pinchin Johnson. Courtaulds announce that they intend to pay a final dividend of 7½ per cent, making 12½ per cent for 1959-60. On this basis the directors of Pinchin Johnson state that accepting holders will receive an income at least equal to that which they have received recently from Pinchin Johnson.

Greenwood & Batley, Ltd., have declared an interim dividend of 10 per cent (unchanged).

The Morgan Crucible Co., Ltd., is paying an interim dividend of 5 per cent (against an equivalent of 3½ per cent after allowing for a scrip issue).

New Companies

Modern Switchboards, Ltd.—Registered 24th December. Capital £2,000. Manufacturers of and dealers in switchboards and electronic apparatus, etc. Directors: F. R. Emerson, R. B. Emerson, D. W. Lee, G. F. Barnes, C. A. Bradsell, E. W. Snale, B. G. Cowan, A. W. Scott and J. J. Henderson. Regd. office: Eastwick Road, Southend-on-Sea.

Dorsay Electrical Contractors, Ltd.—Registered 30th December. Capital £100. Directors: R. A. Evans and V. A. Holton. Regd. office: Weston Green, Hampton Court Way, Thames Ditton, Surrey.

Domec, Ltd.—Registered 30th December. Capital £1,000. Manufacturers of and dealers in domestic, household and general electrical and other equipment, etc. Directors: R. J. McHenry and R. Skellam. Regd. office: Wingood House, 1206, Stratford Road, Hall Green, Birmingham, 28.

H.H. Electrical Engineering & Contracting Co., Ltd.—Registered 29th December. Capital £15,000. To acquire the business of an electrical equipment specialist carried on by H.

Hull as H.H. Electrical Co., at 5, Kirby Street, E.C.1. Directors: H. Hull and B. L. Hull. Regd. office: 5, Kirby Street, E.C.1.

G. J. Williams (Electrical Contractors), Ltd.—Registered 30th December. Capital £1,000. Regd. office: 64, Tudor Road, Hayes End.

Transitron Electronic, Ltd.—Registered 24th December. Capital £1,000. Electronic, electrical and mechanical engineers, manufacturers of transistors, photo-transistors, diodes, rectifiers and other semiconductors, etc. Directors: D. Bakalar and L. Bakalar. Solicitors: Bracewell & Leaver, 7/8, Norfolk Street, W.C.2.

Advance Domestic Appliances, Ltd.—Registered 24th December. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: G. Curtis and P. Curtis. Regd. office: 124/6, High Street, Edgware, Middx.

Plucknetts Radio & Electrical, Ltd.—Registered 17th December. Capital £6,000. Designers, manufacturers of and dealers in television, radio, electrical and other apparatus, etc. Directors: W. J. Plucknett, Mrs. Winifride E. Plucknett, D. V. J. Plucknett and Mrs. Beryl E. B. Plucknett. Regd. office: 20, South Street, Torrington.

Crouchman & Perry, Ltd.—Registered 17th December. Capital £1,000. To acquire the business carried on by Crouchman and Perry at 5, Park Crescent, Enfield, Mdx., and to carry on the business of electrical contractors and retailers, etc. Directors: B. Crouchman and A. V. Perry. Regd. office: 63, London Road, Enfield, Mdx.

Harold Payne, Ltd.—Registered 16th December. Capital £1,000. Electrical engineers and contractors, etc. Directors: P. H. Payne and Mrs. Sissie Payne. Regd. office: 7, Highfield Crescent, Blackheath, Birmingham.

Anstee & Ware (Installations), Ltd.—Registered 9th December. Capital £1,500. Electrical engineers and contractors, etc. Directors: G. H. Anstee, V. C. Ware, R. H. De D. Austin, J. W. Anstee and L. A. Perrett. Regd. office: St. Andrews Road, Avonmouth, Bristol.

G. A. Rix, Ltd.—Registered 10th December. Capital £15,000. To acquire the business of an electrical engineer carried on by G. A. Rix at Keighley, Yorks, etc. Directors: G. A. Rix, J. G. Rix and M. H. Rix. Regd. office: Victory Works, Dalton Lane, Keighley.

C. F. Yates, Ltd.—Registered 16th December. Capital £2,500. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Directors: Phyllis M. Lucas and C. F. Yates. Regd. office: 275, Chorley Road, Swinton, Lancs.

Hare & Hooker, Ltd.—Registered 14th December. Capital £1,000. Electrical and mechanical contractors, etc. Directors: R. F. Hooker and J. G. Hare. Regd. office: 334, Eden Park Avenue, Beckenham, Kent.

Hamilton Controllers, Ltd.—Registered 23rd December. Capital £1,000. Mechanical and electrical engineers, etc. Directors: T. W. Hamilton and Mrs. Constance B. Hamilton. Regd. office: 27, Clevehurst Close, Stoke Poges, Bucks.

Greyfriars Productions (Fittings), Ltd.—Registered 23rd December. Capital £5,000. To acquire the business of wholesale and retail sales of electrical accessories carried on by Greyfriars Productions at "Priors Lea," Balsall Common, near Coventry. Directors: M. Harold and Mrs. Jose D. Harold. Regd. office: 14, Albany Road, Coventry.

Heaton Electrical Co., Ltd.—Registered 23rd December. Capital £100. Directors: S. W. Rothwell and Mrs. Bessie Rothwell. Regd. office: 108, Alexandra Road, Moss Side, Manchester, 16.

Bankruptcies

J. C. Bruce, 3, Cunliffe Road, Ilkley, Yorks., electrical dealer and contractor.—Trustee, Mr. N. Tomblin, 16, Brook Street, Ilkley, appointed 30th December.

P. G. A. McCarthy, trading as Parmac Electrics, 74, Gillygate, York, lately carrying on business at 14, Gillygate, York, electrical

retailer.—Trustee, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, 1, appointed 23rd December.

G. B. Bullen, 58, Canada Road, Cardiff, electrician.—Receiving order made 30th December on a creditor's petition.

D. W. Dammis, electrical contractor, 181, Wellington Street, Grimsby.—Trustee, Mr. L. F. McCulloch, 26, South St. Mary's Gate, Great Grimsby, appointed 30th December.

F. J. Crutchley, carrying on business at 9, York Street, Hulme, Manchester, previously residing at 70, Queen's Road, Urmston, near Manchester, and carrying on business at 304, Deansgate, Manchester, electrical engineer, formerly company director.—Supplemental dividend of 1s 1½d in the £, payable at the Official Receiver's office, 20, Byrom Street, Manchester, 2.

W. R. Woods, electrical retailer, 136, Claremont Road, Moss Side, Manchester, trading as Banwood Electrics, and previously carrying on business in partnership with another.—Receiving order made 30th December on debtor's own petition. Public examination 26th February at the Court House, Quay Street, Manchester.

E. Greenwood, Westgate, Elland, Yorks., electrician.—Public examination 1st March at the County Court, Prescott Street, Halifax.

B. F. J. Brill, 64, Princess Street, Luton, electrical engineer.—Public examination 3rd March at the Court House, Stuart Street, Luton.

J. G. Wadsworth, trading as the Nene Road Electrical Co., at 10, Westfield Terrace, Higham Ferrers, Northants., electrical engineer and motor accessories dealer.—Supplemental dividend of 19s 8d in the £ (making 20s in all), together with 4 per cent statutory

interest, payable on and after 26th January at the office of the Official Receiver, 15, Guildhall Road, Northampton.

Liquidation

Phoenix (Electrical Contractors), Ltd., 16-18, Church Road, Hove.—Winding up voluntarily. Liquidator, Mr. F. R. Hews, "Tudor Court," 52, Richmond Road, Worthing, appointed 14th December.

STREET LIGHTING PLANS

Ashton-under-Lyne Corporation is recommended to make provision in the capital estimates for 1960-61 for street lighting improvements estimated to cost £12,250.

Bedford Highways Committee proposes to install fluorescent lamps in various streets at an approximate estimated cost of £13,000.

Bradford City Council has approved a provisional programme submitted by the street lighting superintendent for improvements to street lighting in various parts of the city during the financial year 1960-61 at an estimated cost of £45,270.

Chatham Town Council is considering a scheme for improved lighting in the town, including the replacement of gas lamps by electric ones. The estimated cost is £80,000.

Dover Corporation is recommended to apply for sanction to borrow £5,000 for improving the lighting in the Elms Vale Road and Astor Avenue area.

Walsall Public Works Committee has authorised the borough surveyor to provide 300 electric lamps and columns in various parts of the borough during 1960-61 at an estimated cost of £24,380.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 30th January:

Tedalex. No. 783,673. Class 7. Drying machines for laundries, electric polishing machines (not domestic) and electric motors (not for land vehicles), and parts.—Television and Electrical Distributors (Pty.), Ltd., Johannesburg, South Africa. Address for service, c/o Gill, Jennings & Every, 51-52, Chancery Lane, London, W.C.2.

Sputnik. No. 772,104. Class 9. Electrically-operated igniting appliances, electrically heated soldering instruments and electrical cleaning apparatus.—Allied Distributing Corporation, Ltd., 13-17, Rathbone Street, London, W.1.

Ultrablitz. No. 789,250. Class 9. Electric and electronic flashlight apparatus for photographic purposes.—Deutsche Elektronik G.m.b.H., Berlin-Wilmersdorf, Germany. Address for service, c/o W. P. Thompson & Co., 12, Church Street, Liverpool, 1.

ERA (design). No. 790,716. Class 9. Radio receiving sets, television receiving sets, sound recording and sound reproducing apparatus and instruments, electronic tubes and electronic valves.—Edicon, Ltd., 166-168, Piccadilly, London, W.1.

Magnastat. No. 792,688. Class 9. Thermally-operated devices for automatically controlling the temperature of soldering irons and of heat-sealing irons for plastics.—Weller Elektro-Werkzeuge G.m.b.H., Besigheim am Neckar, Germany. Address for service, c/o H. D. Fitzpatrick & Co., 3, Gray's Inn Square, London, W.C.1.

Vendextimer. No. 794,208. Class 9. Electric time switches.—Autoslave Equipment, Ltd., 1, 3 and 5, Broad Street, Northampton.

Chancellor. No. 795,339. **Diplomat**. No. 795,340. **Milord**. No. 795,341. **Peerage**. No. 795,343. Class 9. Electric vacuum cleaning apparatus and parts.—Bylock Electric, Ltd., 109, South Street, Enfield, Middx.

Pakatherm. No. 794,008. Class 9. Blankets and pads, all for warming and airing

beds, and all being electrically heated.—Servitor Textiles, Ltd., Moorside Mill, Moor-side, Oldham, Lancs.

Candy. No. B789,757. Class 11. Refrigerators and parts.—G.B.C. Electronic Industries, Ltd., 121-3, Edgware Road, London, W.2.

Marathon. No. B791,794. Class 11. Electric lamps.—H. W. Oliver and D. F. Davies, trading as H. W. Oliver & Co., 4, Gorleston Street, London, W.14.

Wynchel. No. 794,291. Class 11. Electric lighting fittings.—Morris Electric, Ltd., Heath Mill Works, Heath Mill Lane, Bordesley, Birmingham, 9.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£186	os	od
COPPER, H.C. Electro	ton	£255	10s	od
Fire Refined 99.70%	ton	£254	os	od
Fire Refined 99.50%	ton	£253	os	od
COPPER Tubes ..	lb	2s	5½d	
Sheet	ton	£285	15s	od
H.C. wire and strip	ton	£302	5s	od
LEAD, English ..	ton	£75	10s	od
Foreign	ton	£74	os	od
MERCURY	flask	£71	10s	od
TIN, block (English) ..	ton	£789	10s	od
ZINC, G.O.B. Foreign	ton	£95	10s	od
BRASS Tubes (solid drawn)	lb	2s	0½d	
Wire	lb	2s	10½d	
PHOSPHORBRONZE				
Wire	lb	4s	3½d	
PLATINUM	oz	£28	10s	od
RUBBER, No. 1 R.S.S.				
spot	lb	35d	(nom.)	

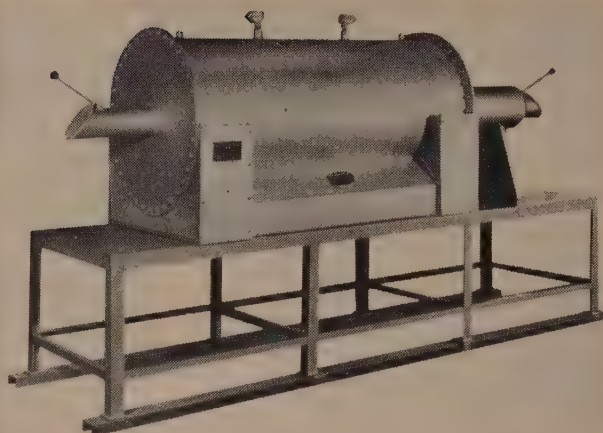
HIGH TEMPERATURE SINTERING FURNACE

A HEAVY-DUTY sintering furnace for operation at temperatures up to $1,650^{\circ}\text{C}$ with a hydrogen atmosphere has been produced by Royce Electric Furnaces, Ltd., Walton-on-Thames, for a special application. The heating chamber is a replaceable fused alumina tube of 5in diameter and 32in heated length. Fused alumina tiles housing the molybdenum heating elements surround the tube along the heated length. A high temperature insulation of porous alumina behind the bricks is backed by graded thermal insulation to reduce heat losses.

At the charging end of the cylindrical gas-tight mild steel furnace casing an extended solid drawn tube acts as a preheat-purging chamber, the exit chamber being water-cooled to ensure

that a charge is below oxidation temperature before leaving the furnace. Hydrogen or cracked ammonia is fed to distribution pipes in the thermal insulation in the base and by percolating through the insulation is preheated before entering the work tube.

There are two independent, automatically controlled heating zones along the length of the chamber. The automatic temperature control equipment is mounted in a separate control desk and comprises three position



Royce heavy-duty sintering furnace

indicating type temperature controllers operating motorised voltage regulators giving stepless variation of the low voltage element supply. When controlling at the pre-set temperature, the secondary voltage of the motorised regulator is automatically adjusted so that the power input to the furnace balances the losses, giving a smooth control and eliminating fluctuations that may occur with "on-off" control. Similar units are in operation with transducer control. The furnace is rated at 25 kW and is arranged for operation on a three-phase supply.

Shell Site Electricians' Pay

AN inquiry was opened on Monday into the causes and circumstances of the strike of 130 members of the Electrical Trades Union at the Shell building site, South Bank, London. Mr. F. Haxell, general secretary of the Union, said that electricians employed directly by Sir Robert McAlpine & Co. received a bonus of £2 15s a week and a "radius allowance" of 5 $\frac{1}{4}$ d for each mile between the site and the employment exchange nearest their addresses. Other craftsmen also received bonuses. The electricians and their mates who were employed by F. H. Wheeler & Co., however, were paid only the standard rate. He agreed that there was nothing in the national agreement for the industry to cover bonus payments, but claimed that at other sites it had been possible to make arrangements for such payments "completely outside and without prejudice to agreements existing in the industry, because of special circumstances."

Mr. L. C. Penwill, director of the National Federated Electrical Association, said that the Association obliged its members to abide by the industrial agreements which the Association made on their behalf. If the committee should recommend some additional payment at the South Bank site, he said, it would spread within 24 hours to every F. H. Wheeler job in the country. Mr. Haxell had made it clear that what was behind the dispute was an application for a general increase in wages particularly where builders were operating payment-by-results schemes. The application was nothing but a subterfuge to defeat or undermine the award of the Industrial Dispute Tribunal which

had rejected a similar claim in relation to electricians working at Television House. To concede the claim would ruin the sanctity of wages agreements in the industry. He said that the electrical contracting industry had been unable to establish a system of payment by results because it could lead to "scamping" a job, which would be dangerous to life and property. Instead, provision had been made for payment on merit.

Before the inquiry opened Mr. R. M. Wilson, Q.C., the chairman, appealed unsuccessfully for a return to work pending the outcome. Mr. Haxell said that his Executive felt itself unable to give an instruction to return to work to men who had acted in a constitutional manner.

Industrial Output Index

The way in which the index of industrial production is compiled is explained in a booklet, published last week, which has been prepared for the Treasury by the Central Statistical Office. ("The Index of Industrial Production: Method of Compilation," H.M. Stationery Office, price 6s.)

The new index for engineering and electrical goods, which was introduced in 1958, is described, and the electrical series and weights used in the calculation of the new and old indices are listed. The booklet also contains the annual figures for the main index and its principal constituents from 1946 to 1958 and the monthly figures from the beginning of 1954 to the end of 1958. It is thus now possible to follow the trend over this whole period on the basis of 1954.

Switchgear Contracts

A. Reyrolle & Co., Ltd., have been awarded a contract by the South of Scotland Electricity Board for the first 275 kV switchgear installation in Scotland. The site for the substation is in the vicinity of Strathaven and it is the first to be provided for the super-grid which will link the main generating stations and load centres. The installation is required to be in commission by early 1962 in order to provide electricity supplies to the new strip mills of Colvilles, Ltd. Reyrolle's have also received a contract from the Central Electricity Generating Board for the 132 kV switchgear required at Richborough, on the Kent coast near Sandwich. Because of its close proximity to the sea, the switchgear is being housed in a building.

Aswan Plant

The first generator at the power station associated with the old Aswan Dam, which was built in 1902 for irrigation purposes only, was started up by President Nasser last Saturday. Mr. Geoffrey Kennedy, of Messrs. Kennedy & Donkin, the consulting engineers who designed the plant, received the Egyptian Order of Merit (First Class). President Nasser also inaugurated work on the Aswan High Dam which will be built five miles upstream from the old dam. The main purpose of the High Dam will be for irrigation, and a hydro-electric station will also be built.

BOWATER'S MERSEY MILLS

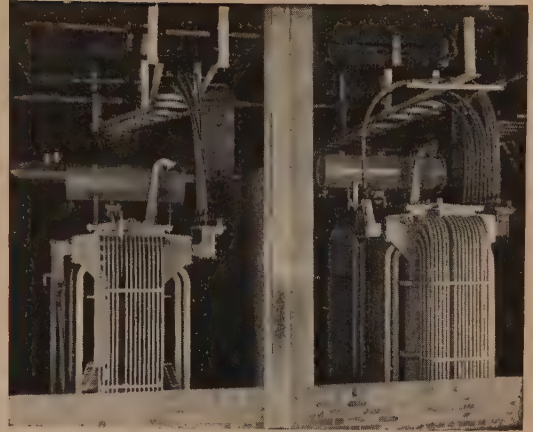
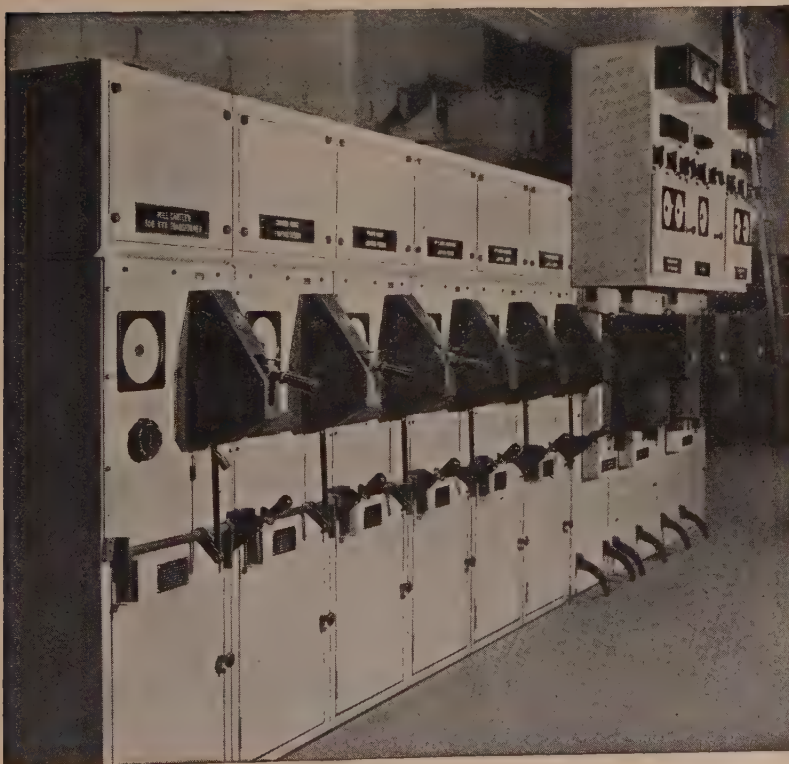
J. & P. plant and cable in paper mill development scheme

The association and friendship which exists between the Bowater Paper Corporation as users, and Johnson & Phillips Limited, as suppliers of electrical equipment, is of over thirty years duration. It emphasises our customers' faith in the products which we have been privileged to supply and is yet another example of the service to industry which we provide under the mark that means that "little more" in quality.

J. & P. Plant installed at the Mersey Division Mills includes eight 11kV/430V transformers — four rated at 2,750 kVA and four at 2,000 kVA—and an 11-panel 3.3 kV air-insulated metalclad switchboard with remotely controlled circuit-breakers.

11 kV, 3.3 kV and 1,100 V paper insulated lead or aluminium sheathed cables of J. & P. manufacture installed by Tanjon (N/C) Ltd., total over 13,000 yards.

The 11-panel air-insulated, metalclad switchboard comprising 3 oil circuit-breaker units and 8 fuse-switch units.



Two of the eight J. & P. transformers supplied for the great construction and extension scheme.



J. & P. 1,100V paper insulated, aluminium sheathed cables with p.v.c. extruded overall to afford protection against corrosion.



The Mark that means that "little more" in quality

JOHNSON & PHILLIPS LTD.

CHARLTON · LONDON · S.E.7



ELECTRICAL ENGINEERS & CABLE MAKERS

The NEW range of— “MEMREX-EXEL” 500 volt Switchgear

**PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.**

10—15—30 Amp. Switches

10—15—30—60 Amp. Switchfuses.

This new range of “Memrex-Exel” switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.

Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.

Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.

Fuses are of the new “Kantark-Exel” pattern which will accept rewirable or H.R.C. fuses. Semi-enclosed rewirable (damper type) patterns comply with B.S.3036 : 1958.

H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S.88:1952, Appendix ‘J’ Dimensions.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88 : 1952, Appendix ‘J’ Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).



“Memrex-Exel” switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S.861: 1955 and B.S.2510: 1954.

All these and many other features.

MEM

WRITE FOR LIST No. 447

MIDLAND ELECTRIC MANUFACTURING CO. LTD.
REDDINGS LANE, TYSELEY, BIRMINGHAM, 11

FIELDS OF APPLICATION OF THE DIFFERENT TYPES OF EQUIPMENT

POWER FACTOR IMPROVEMENT

By D. D. Stephen, B.Sc., A.M.I.Mech.E., A.M.I.E.E., Assoc.A.I.E.E., and H. K. Hadley, A.M.S.E.*

The operating power factor of an electrical circuit is a measure of the utilisation of the apparatus involved since the sizes of all the generators, transformers, supply lines, etc., and their associated losses, are determined by the kVA circulated and not by the kW rating. For this reason most suppliers of electricity determine their charges not only on kWh consumed but also consider the power factor at which the load is taken. The authors explain the economics of p.f. improvement and describe the fields of application of the different types of correction equipment

THE power factor of all industrial loads can be improved but this usually involves capital expenditure, and it is desirable to balance the cost of power factor improvement against the reduction of power costs obtained before deciding how much to improve the power factor of the load. It is seldom found to be economical to raise the power factor to unity and usually a power factor of about 0.95 is found to be the optimum.

There are three distinct ways in which the power factor of a system can be improved:—(a) The incorporation of condensers or capacitors in the installation to provide leading kVAr; (b) the installation of new drives operating at a higher power factor than the overall load power factor; (c) the replacement of drives by others operating at a better power factor.

The choice between these alternatives depends on the

actual circuit conditions and the economics of power costs, although factors such as future developments and possible replacement or extensions of drives should also be considered carefully.

The effects of installing power factor improvement equipment in an existing circuit can be calculated from first principles by evaluating the kW and the kVAr components of the existing load and adding the corresponding components of the new equipment. It is often more convenient and quicker when trying to analyse such a system to use some generalised curves such as those indicated in Figs. 1 and 2. These have been simplified for clarity, but they can be prepared for any required degree of accuracy.

As an example, consider a 50 h.p. motor which has a full load efficiency of 85 per cent and power factor of 0.8, then its full load input power is 43.9 kW and the kVA is 54.9. The corresponding lagging kVAr is 32.9. To raise the power factor to 0.95, the lagging kVAr must be

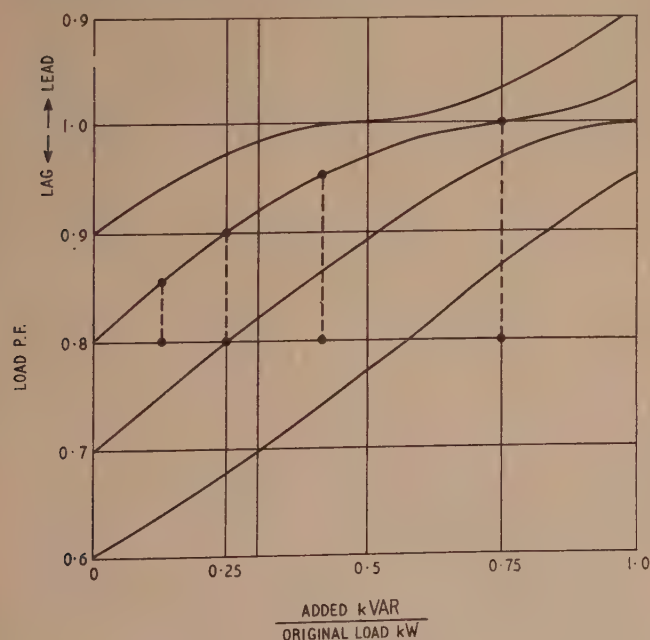


Fig. 1.—Effect of adding reactive kVA to an existing load

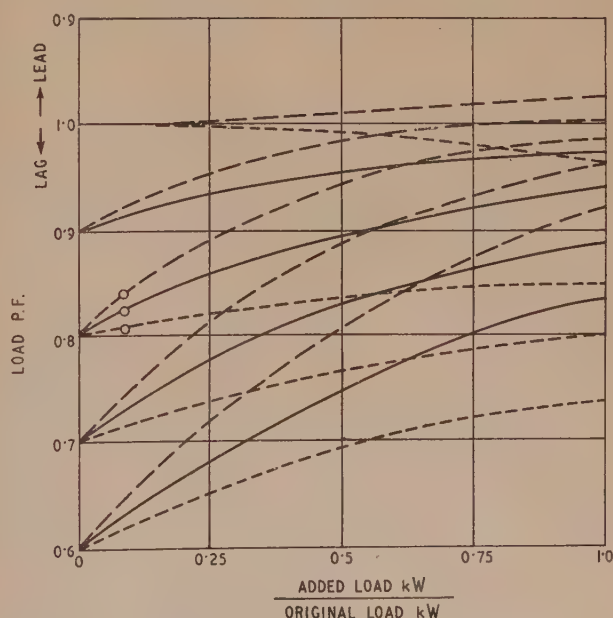


Fig. 2.—Effect of adding new load with leading p.f.

* Mr. Stephen is with the A.E.I. Heavy Plant Division, Rugby, and Mr. Hadley was formerly with the B.T.H. Co., Rugby.

reduced to 14.5, that is, 18.4 leading kVAr must be added.

Using Fig. 1, to raise the power factor from 0.8 to 0.95, the ratio of added kVAr to original load kW is 0.42, thus the added kVAr equals 0.42×43.9 which is also 18.4.

It can be seen from these curves how the cost of improving the power factor increases as the power factor increases. Fig. 1 indicates that to increase a power factor of 0.8 lagging to 0.85 would require added kVAr of 12.5 per cent, improvement to 0.9 requires 25 per cent, improvement to 0.95 requires 42 per cent, while improvement to a power factor of 1 requires 75 per cent added kVAr. It is for this reason that a load power factor is seldom corrected to above 0.95 lagging.

Fig. 2 shows that the addition of a motor taking 1,000 kW to a load of 10,000 kW at 0.8 power factor would raise the power factor from 0.8 to 0.825, using a 1 power factor motor. A 0.9 leading power factor motor would raise it to 0.845, while a 0.9 lagging power factor motor would raise it to only 0.807.

This example illustrates how this chart can be used to determine the change in system power factor by replacing an existing machine by another. For example, if a 1,000 kW induction motor operating at a power factor of 0.9 lagging on a system with an overall power factor of 0.807 lagging and 11,000 kW total load, were replaced by a 1,000 kW synchronous motor operating at a power factor of 0.9 leading, then the overall system power factor would be raised to 0.845 lagging.

Apparatus for improving a power factor may be either static or a rotating machine, and the most commonly used types are: static capacitors, compensated induction motors, synchronous motors and synchronous condensers.

The first and last types provide only reactive kVA while the others provide shaft h.p. in addition, and this is the first factor which determines the most suitable form of apparatus for any particular situation.

Static Capacitors

Standard oil-immersed capacitors are manufactured in units which can be connected in parallel to obtain the desired capacitance, and in series to suit the supply voltage. One result of this is that the cost per kVA is nearly constant. Static capacitors require no special erection, no maintenance, and consume negligible power, the internal loss in kW usually being less than 0.5 per cent of the kVA rating. On the other hand, the static capacitor is not as flexible as a rotating machine, since to suit variations in load, the capacitor units must be switched in and out in sections, whereas a rotating machine can provide a continuously variable amount of kVAr.

The power factor of a system may be improved by individual correction, by group correction, or by means of a centralised capacitor bank. Fundamentally, it is desirable to correct low power factor as near as possible to the offending apparatus. By doing this, the transmission losses are reduced from the apparatus back to the source of supply. Another advantage of individual correction is that no extra control gear is required. For example, in the case of an induction motor, the capacitor can be connected directly to its terminals, therefore the motor switch also controls the capacitor, and corrective kVAr is automatically applied when the motor is switched into circuit, and switched out again when the motor is switched off.

In the case of an installation employing a large number of small motors operating from several feeders, it may not be practicable to apply individual correction. In such cases group correction may, by circumstances, be dictated

but it should be noted that this method does not reduce transmission losses between the source of low power factor and the group capacitor. In choosing a suitable capacitor bank for a group, consideration must be given to variation of load and power factor of that group. Various sections of the group capacitor might have to be switched in and out according to load and power factor, and considerable care would be necessary if manually-switched capacitors were used to match the capacitance with the inductive load, otherwise under- or over-correction would occur. Automatic capacitor control would eliminate this possibility.

If it is not practicable to use either of the two preceding methods, then centralised correction would have to be used. Such a method only relieves transmission losses between the centralised capacitor and the source of supply, e.g. substation, and control gear and feeders to the offending apparatus receive no benefit from this correction. With centralised correction, some form of automatic capacitor switching would be essential on any large installation.

The most important use of the capacitor is in industrial systems employing induction motors, none of which is large enough to warrant replacement by machines designed for power factor improvement. It is well known that the main reason for the lower power factor of induction motors is that their magnetising current, which is in quadrature (lagging) with the voltage, must be supplied from the a.c. line. In this respect induction motors differ from synchronous machines in which the magnetising current is supplied as d.c. and does not lower the power factor of the a.c. input.

A capacitor having a kVAr rating greater than the motor magnetising kVA could cause self-excitation and produce excessive voltage at the motor terminals, if the supply was interrupted with the motor running near synchronous speed.

To avoid the possibility of self-excitation the British Standard Code of Practice on installation and maintenance of electrical machines, capacitors and associated equipment, C.P. 321, 102 (1950), states that the corrective kVA should not exceed 85 per cent of the motor magnetising kVA. The usual tolerance on the kVAr rating of a capacitor allows +10 per cent on the stated value. The figure of 85 per cent takes care of this tolerance. These considerations provide another reason why group or centralised correction capacitors may have to be switched in sections; for example, if only one motor is left running with sufficient capacitors connected to correct for several

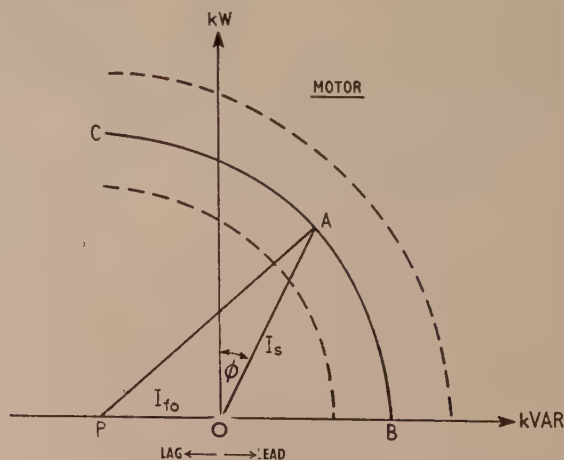


Fig. 3.—Theoretical excitation characteristic of synchronous motor

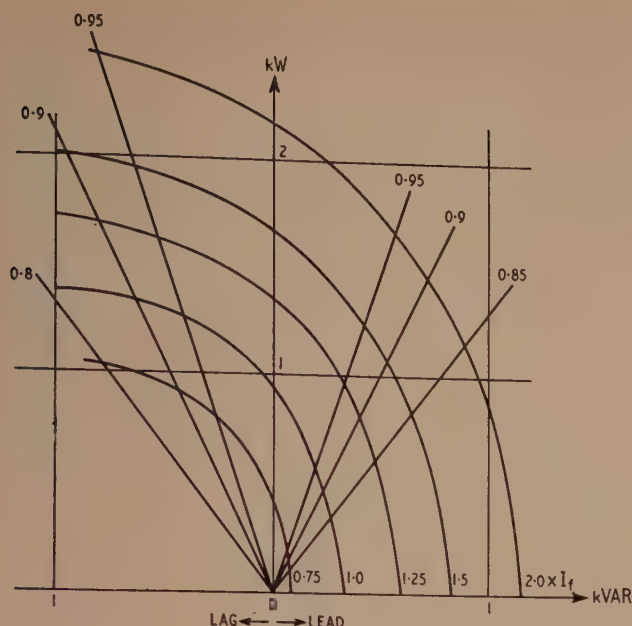


Fig. 4.—Practical characteristic showing effect of saturation

machines, the single motor might be self-excited in the event of interruption of the supply.

A.C. Commutator Motors

Normal induction motors operate at lagging power factors, but they can operate at unity or leading power factors if provided with a suitable phase-advancer connected into the rotor circuit. These phase-advancers can take various forms and may be either series wound such as the "expedor" type, or shunt wound as in the "susceptor" type. Such machines can be regarded as exciters, and they are mechanically separate from the main induction motor. It is possible, however, to combine the phase-advancer with the induction motor in one machine, this arrangement being more suitable for industrial purposes. Typical of this class is the "No-Lag" motor (B.T.H.) which is a compensated induction motor incorporating a susceptor type of phase-advancer within itself.

Synchronous Motors

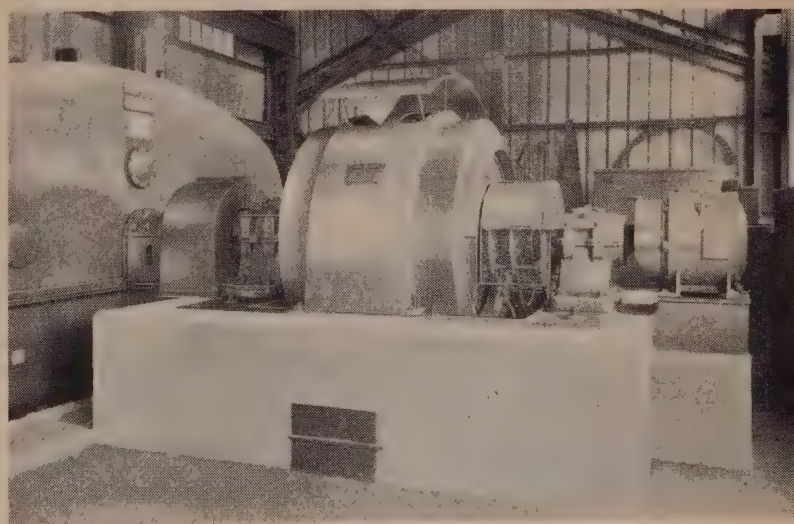
When motors operating at unity or a leading power factor are required for situations where the compensated induction motor cannot be applied, synchronous motors are the most suitable. There are many types of synchronous motor, each having individual advantages and being suitable for particular applications, but they all possess the same synchronous characteristics and can all be used for power factor improvement. Salient pole machines, which have concentrated field windings, are the most suitable type for operation at a leading power factor as they can be designed to carry greater amounts of excitation more economically and, where appreciable power factor correction is required, they are normally used.

The theory of synchronous machines is well known and, with certain simplifying assumptions, results in the very simple circle design. Briefly, the excitation system must carry a current I_{f0} which will produce flux in the machine to give rated terminal voltage on no load, thus in Fig. 3 if PO represents excitation, then the point O indicates the no-load position. When current flows in the a.c. winding of a synchronous machine it produces an armature reaction which must be cancelled by the excitation system

if the voltage is to remain the same. The load value of excitation thus consists of the no-load component I_{f0} and the armature reaction or load component I_s which is at some power factor $\cos \phi$. The vector sum is I_f , the total excitation required. By a suitable choice of scales the value I_s which represents a component of field current can represent the a.c. current and also the kVA to which it is proportional, provided the voltage remains constant. Since $\cos \phi$ is the power factor, the vertical axis thus indicates useful current or kW and the horizontal scale reactive current or kVAR. Operation to the right of O is called the over-excited region and the kVAR is capacitive and improves the overall system power factor. The kVAR is called leading for a synchronous motor, but lagging for a generator, since the direction of power flow is then reversed. For the ideal machine which has constant excitation operation would give a characteristic which has a circle centre P and radius PA, and the value of kVAR produced and the power factor, could then be obtained for the value of kW given, or supplied to the machine. Actual machines have saturation and leakage effects and their characteristics are not exact circles, as can be seen in Fig. 4. When the point A, in Fig. 3, represents full load, then I_s is rated full-load stator current at a power factor $\cos \phi$, and I_f is the rated full-load field current. Thus the curve BAC represents operation at constant full-load excitation, and shows how the kVAR varies with the kW. Thus, as kW are reduced, the amount of leading kVAR increases, and if kW are increased, the amount of leading kVAR reduces and finally changes to lagging kVAR which increases until the pull-out point C, which is the maximum value of kW which the curve reaches. For a synchronous motor this value of kW corresponds to the synchronous pull-out torque, and is the maximum load which the motor can provide without losing synchronism when provided with full-load excitation. The characteristics for other values of excitation are also shown, and it will be seen that increase in excitation increases the amount of leading kVAR, or reduces the amount of lagging kVAR for a given value of kW, and also increases the pull-out value of kW, while the opposite occurs when the excitation is reduced.

Motors are normally designed to operate continuously with full-load excitation without the temperature rise of the field windings exceeding the specified value, and it is not usually possible to operate such machines continuously with greater values of excitation. Motors can

Fig. 5.—1,600 h.p., 0.9 leading p.f., 500 r.p.m. salient pole synchronous induction motor driving cement grinding mill



operate with lower values of excitation, but the pull-out torque will be reduced accordingly.

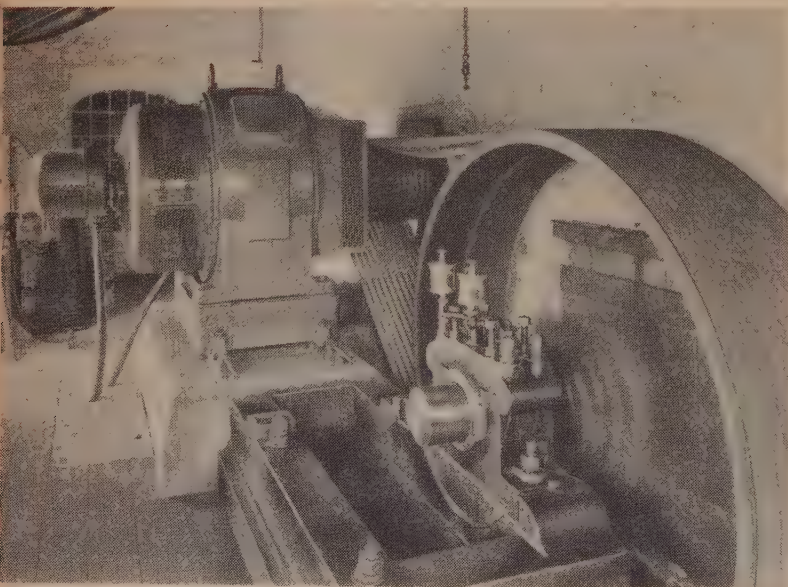
The leading kVAR taken by a synchronous motor increases as the shaft power is reduced, and decreases as the power is increased until it reaches zero, and then goes lagging. When a motor operates at or about full load continuously, the amount of kVAR it takes can be easily determined and remains constant, and the motor can be operated with constant full-load excitation. When the motor load fluctuates between full load and no load the kVAR taken does not vary much, and it always equals or exceeds the amount provided at full load. Under these conditions the synchronous motor can be regarded as a fairly constant impedance capacitor. Motors occasionally have to carry short-time peak loads, of the order of a few seconds, and during this condition the motor takes lagging kVAR but, because of the very short time duration, this does not usually affect the power charges appreciably, and the advantages of simplicity and low first cost make operation with constant full-load excitation the most usual arrangement.

Automatic Excitation Control

When variations of kVAR are undesirable it is possible to provide automatic control of excitation to a synchronous motor. Various forms of control are available and each can be used in several alternative ways. Control can be of the relatively simple compensated or compounded types or of the more elaborate error-actuated closed loop types. When the latter is used it is possible to maintain either the power factor or the kVAR within very close limits of a pre-selected value or combinations of such limits. The former types can give an approximation to such control, but are unsuitable for high accuracy without considerable expense. They are more usually restricted to maintaining the power factor within fairly wide limits from the selected value.

There are now a large number of alternative arrangements which give compensated or compounded forms of control, but the basic principle on which the more accurate are based is associated with the simple circle diagram shown in Fig. 3. An excitation component, I_{fo} , depends on the machine voltage, while an armature reaction excitation component, I_{sa} , depends on the machine current. The relative phase of these components is determined by

Fig. 6.—90 h.p. "No Lag" power factor correction motor driving colliery ventilating fan



the power factor. It is possible to obtain an excitation supply from the voltage at machine terminals either directly, or through a voltage transformer and another from a current transformer, and if these ratios were suitably selected, the components would actually be I_{fo} and I_{sa} . To get these components in the correct relationship it is necessary to inject the current transformer supply into an impedance network in series with the voltage supply. The sum of these components then gives I_f and this can be rectified and fed to the excitation winding. This relatively simple arrangement would give accurate power factor control if the simple circle diagram were accurate. It has been shown in Fig. 4, however, that the constant excitation loci are not pure circles, and this effect results in the simple compounded excitation control giving fairly constant power factor control at low loads, and small voltage variations, but giving increased error of control at higher loads, and greater voltage variations.

Various refinements can be made to this type of control to improve the accuracy of control, but they also increase the cost, and if close control is really desirable then an error-actuated scheme should be used. The accuracy of such a scheme can be made as close as desirable, although cost again increases when very great accuracy is required. The rate of response can also be selected to suit the application, and can be of the same order as the compensated type of scheme, or can be very much faster.

Automatic excitation control may be provided for reasons other than control of kVAR. A motor provided with such control may be made smaller and cheaper than one not having such control, and this fact is often of great value when motors driving very peaky loads are being considered. Automatic control to maintain unity power factor gives maximum operating efficiency, and may be justified on large motors driving very variable loads. In all such instances, of course, the effect of kVAR control is considered, and a compromise form of control may be used to combine both advantages.

When synchronous machines are used to improve the power factor of a system, and either the machine or the system loads fluctuate appreciably, it is often economical to provide automatic excitation control for the machines, and to arrange for the control to operate on the total demand kVAR to keep this value within limits. In this way the provision of excessive kVAR can be avoided, as the synchronous machines will provide only the amount required by the actual system load at any particular time. Any variation of load will cause the synchronous machine excitation to be automatically adjusted to provide the correct amount of kVAR then required. The advantages will be appreciated of this type of control over the block switching of static capacitors which can only correct the kVAR within the magnitude of the capacitor switching steps provided.

Synchronous Condensers

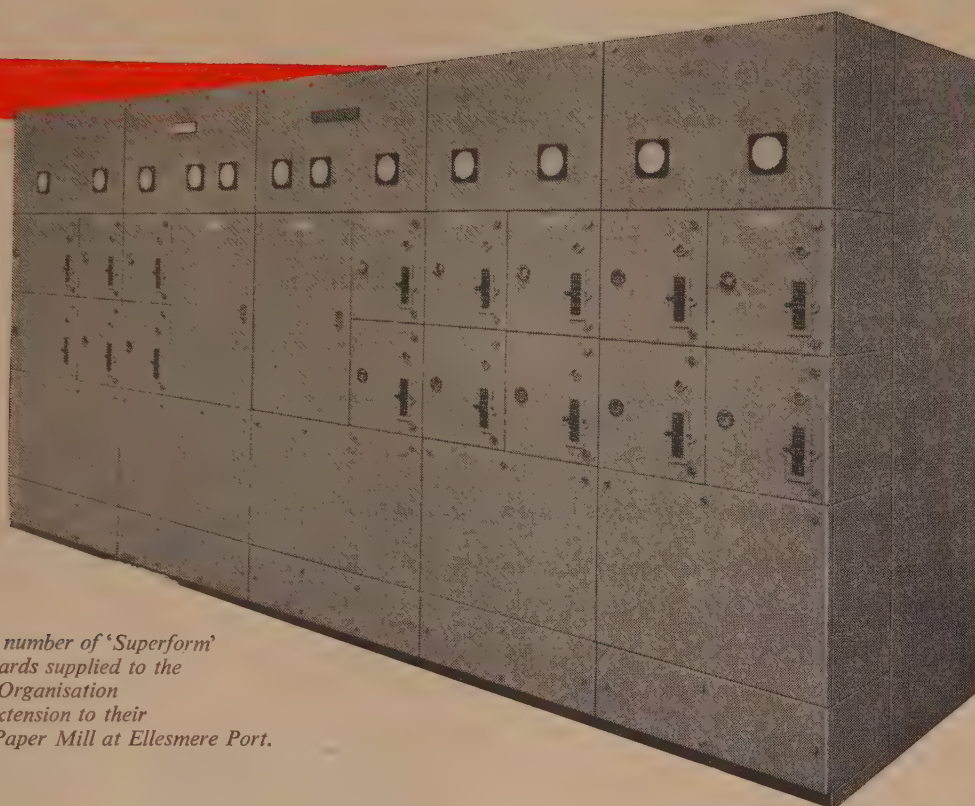
A synchronous motor running on no load would operate on the horizontal axis of Fig. 3 except for the losses in kW which are only of the order of 2 or 3 per cent of the rated kVA. It would then act as a condenser when over-excited, that is working to the right of O, and as a reactor when under-excited, i.e. working to the left of O. Such a machine when provided with automatic excitation control can be used to improve the power factor of a system, and to keep the overall power factor or kVAR within very close limits.

The cost of synchronous condensers is not constant per kVAR, as is the cost of static capacitors, but decreases as the size of unit increases. They can, of course, be wound

[Continued on page 131]

'SUPERFORM' switchboards

for all industrial distribution schemes



One of a number of 'Superform' Switchboards supplied to the Bowater Organisation for the extension to their Mersey Paper Mill at Ellesmere Port.

Composite boards can be supplied covering all the requirements of modern M.V. systems, the range of equipment including:

- Air circuit-breakers up to 3000 amps.
- Off-load isolators up to 3000 amps.
- Load-breaking fuse-switches up to 750 amps.
- Contactor gear for motor starting or other duty
- Distribution fuseboards
- Instruments, meters and relays of all types

Plus

- Modern styling and pleasing appearance
- Unique design features giving increased safety to operating personnel
- Easy access for cabling and maintenance
- Fault making capacities up to 50 MVA at 440 volts
- Complete short-circuit protection

'ENGLISH ELECTRIC'

fusegear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

Fusegear Division, East Lancashire Road, Liverpool, 10

WORKS: STAFFORD • PRESTON • RUGBY • BRADFORD • LIVERPOOL • ACCRINGTON



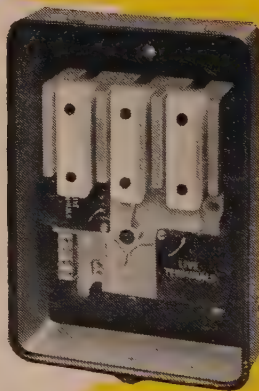
NEW

all contractors and
consulting engineers
will want to use
these **NEW**

"HIDUTAC" SWITCHFUSES

**SINGLE POLE AND NEUTRAL - DOUBLE POLE -
TRIPLE POLE - TRIPLE POLE AND NEUTRAL**

Men whose business it is to assess and advise are quick to appreciate the very real advantages offered by G.E.C.'s new Hidutac switchfuses. Unlimited full load switching. High breaking capacity. High fault current protection. Absolute safety. These are the performance features that the experts like so much, but they also welcome the smaller size and the good looks of this advanced range of switchfuses. As it is made by G.E.C., they naturally take its reliability for granted.



15, 30 or 60 amp. 440 volt a.c. Single Pole and Neutral, Double Pole, Triple Pole, Triple Pole and Neutral Switchfuses with interchangeable H.R.C. or rewirable fuses.

G.E.C.

INSTALLATION EQUIPMENT DIVISION

SWITCH AND FUSE GEAR • H.R.C. FUSES • OVERHEAD BUSBARS • RISING
MAINS • CONDUIT • CABLE TRUNKING • UNDERFLOOR CABLE DUCTS •
ELECTRIC WIRING ACCESSORIES • BELLS

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Power Factor Improvement (Continued)

for connection to all normal system voltages. It has been found that synchronous condensers are not competitive with static capacitors in sizes below about 1,000 kVA, where the converse applies above about 10,000 kVA. In the intervening range, secondary factors such as system voltage or continuously variable kVAr are usually the deciding ones. Synchronous condensers are, consequently, used solely for power factor control only on fairly large systems, although they may be used on fairly small systems for other specific purposes. Such machines can reduce voltage variations produced by suddenly changing loads, such as furnaces, and their power factor improvement characteristics are then secondary advantages.

When only small amounts of kVAr are required to give economic power factor correction, then static capacitors should first be considered. Providing these would not

produce over-correction or self-excitation of motors, they would usually be the best choice, with least inconvenience if individual correction were used. When group or centralised correction, either with or without section switching, is required, the possibility of using the compensated induction motor or synchronous motor should be investigated.

These might be used to replace existing induction motors or to drive new loads if required. When large synchronous motors can be used, consideration should be given to whether constant excitation or some form of automatic excitation control would give the most satisfactory results.

Synchronous condensers are usually only economic in sizes well above 1,000 kVAr, but their continuously variable kVAr control, and desirable stabilising effects on system voltage and unbalance, might make them economic at fairly low values of kVAr.

HEATING OF FOOTBALL PITCHES

SPEEDIER METHOD OF CABLE INSTALLATION DEMONSTRATED

IN our issue of 23rd January, 1959, details were given of the electrical turf warming system installed at the Everton Football Club's ground at Liverpool. The installation has proved to be a practical success and several matches have been played which might otherwise have been postponed because of frost or snow-covered pitches. This particular installation was carried out during improvements to the pitch, which included the removal of the turf and top soil, thus simplifying the cable laying. Other football club managements and greyhound track authorities interested in the application of this technique for anti-frost protection may, however, be reluctant to undertake the work because of the inconvenience and length of time associated with the laying of cables by normal methods.

Last week, at the London Electricity Board's sports ground, Raynes Park, a system of laying heating cables without rendering the pitch unusable during the progress of the work was demonstrated. Arranged by the London Electricity Board and the British Electrical Development Association in collaboration with Calidec, Ltd. (manufacturers of the cables supplied for the Everton installation), the demonstration showed how, with the aid of a mole plough, cables could be laid without removing and relaying

the turf. The mole plough, specially designed by Calidec for this particular purpose, is mounted on a variable fixing towbar for attachment to any standard tractor fitted with hydraulic equipment. For the demonstration it was used to lay approximately 2,200 yd of heating cable over an area 60 yd long by 6 yd wide. The cable, which was laid 6in below the surface and spaced 6in apart, was p.v.c. insulated stranded steel alloy conductor, jointed and hermetically sealed to cold tails of stranded flexible copper cable provided with double thickness p.v.c. insulation.

Previous experiments conducted by the Sports Turf Research Institute have indicated that a satisfactory performance is obtainable when soil warming cables are laid at this depth and spacing with electrical loadings of 10 W/sq ft. For a full-sized football pitch, it is estimated that the cost of supplying and laying the heating cables only, in the manner demonstrated, will be in the region of £2,250 to £2,500 and that the operation can be completed in approximately ten working days. The total installed load for a football pitch is of the order of 650/800 kW and the supply is obtainable during off-peak periods.

The heating cables can be switched on in sections adjusted to suit the air temperature: e.g. if the air temperature is of the order of 36°F it may be necessary to use only approximately one-third of the total loading. When the air temperature approaches freezing point the whole installation must be switched on to ensure that the pitch is maintained in a playable condition. Assuming the cost of electricity does not exceed 1d/kWh, the running cost would be approximately 65s an hour when the total load has to be connected during frosty weather or for snow clearance purposes.

Norwich Street Renovation

AN article in the *Electrical Review* of 18th September last described the way in which Magdalen Street, one of Norwich's historic thoroughfares, was rejuvenated, with particular reference to the lighting installation. The Civic Trust (79, Buckingham Palace Road, London, S.W.1), which sponsored the scheme, has now published a brochure (price 5s) telling the story of the work from inception to completion. It includes panoramic and coloured photographs of the street before and after treatment and shows in a very effective way how the appearance of a town can be transformed at comparatively small cost.



Demonstration of cable-laying at the L.E.B. sports ground

NEW ELECTRICAL EQUIPMENT

Vernier Potentiometer

The precision vernier d.c. potentiometer announced by the DORAN INSTRUMENT CO., LTD., Stroud, Glos., measures from 1 μ V to 1.89999 V in two ranges. The main dial has 18 steps of 0.1 V each; the second dial, a vernier on the first, has 99 steps of 0.001 V and the third dial comprises 99 steps of 0.00001 V. The instrument is standardised by balancing a standard cell against an auxiliary potential divider which has a range of adjustment from 1.01800 to 1.01900 V. This adjustment, carried out by coarse and fine rheostats, may be made without disturbing the setting of the potential dials and checked at any time without interrupting a test. It is intended for use with an external galvanometer, a standard cell and a 2 V accumulator, the latter supplying the potentiometer current. The circuit is arranged so that two e.m.f.s can be measured in turn by a selector switch.

The use of copper terminals, aged manganin for the potentiometer network, and precious metal contacts on all switchgear, ensures a low temperature coefficient and negligible thermal e.m.f.s. The galvanometer tapping switch is of the dual pressure type, a light pressure connecting the galvanometer into the circuit through a protective resistance, and further pressure giving direct connection. Accessories for the instrument, which has an accuracy of 1 part in 100,000 of the 1 V setting, include a reflecting galvanometer unit, a single Weston normal cell in a circular metal case and air-cooled standard shunts.

Lighting Fittings

A new range of artistic Danish lighting fittings for ceiling, floor standard, or table lamp use has been introduced by G.B.M. (ELECTRICAL) BIRMINGHAM, LTD., 439, Moseley Road, Birmingham, 12. A pleated washable plastic material is used for the lantern and ceiling light, both of which are available in a range of colours. The lantern is in two sizes: 10in diameter at £2 8s 4d plus 7s 10d purchase tax and 12in diameter at £2 19s 6d plus 9s 8d. The ceiling light accommodates two 100 W lamps, measures 20in across and is priced at

£3 4s plus 10s 5d tax. The floor standard has a raffia shade, available in two-tone colours, and is 10in in diameter and 14in high with legs. The price is £2 6s 7d plus 7s 7d tax. A larger fitting, 14in in diameter and 18in high with legs, is priced at £3 1s 6d plus 10s tax. The pendant raffia shade, also in two-tone colours, is 7½in in diameter by 11in deep and the price is £1 7s 10d plus 4s 6d tax.

Motor Speed Control

The series of electronic speed controllers being marketed by METRIX INSTRUMENTS, LTD., 54, Victoria Road, Surbiton, Surrey, for use with d.c. motors from 1½ to 10 h.p. gives a wide range of speed control with a fine degree of adjustment, a high



Metrix motor speed controller

efficiency and constant speed at any one setting for wide and rapid changes of load conditions. The "Magnedyn" equipment is supplied from a.c. mains and the motors are fed from a rectified supply to both the field and armature windings. The speed is controlled by varying the reference voltage applied to the armature manually or automatically. An electronic and a magnetic amplifiers are incorporated. If the armature voltage drifts from the value selected at any position of the speed control, the electronic amplifier regulates the energy necessary to maintain the speed of the motor through the magnetic amplifier.

The control amplifier circuit limits the maximum current supplied to a given value, normally a little more than that required to give normal working torque, and gives constant

torque starting. Instantaneous braking is obtained by short-circuiting the armature in the "stop" position of the control, whilst still feeding the field circuit. The motor speed can be governed to within 1 per cent by a tachometer circuit controlled by the motor and feeding back the error signal.

Portable Welding Transformer

The latest version of the "Fararc" toroidal welding transformer, the "Fararc 240," incorporates insulation that allows more continuous use on heavier gauge rod without overheating. This is achieved by independently impregnating and baking the primary and secondary windings. The unit weighs 95 lb and is contained in a square steel and aluminium case with 14in sides, the case having a stoved grey hammer finish. The open circuit voltage is 50 V and the current range is from 60 to 300 A with a continuous rating of 200 A. The standard windings are for 200/250 and 400/440 V supplies but special windings for 110 V, 500/550 V and other voltages are available. The set will operate with electrodes of from 14 to 4 gauge.

The windings are double glass insulated, wrapped where necessary with glass woven cloth, triple impregnated with pure silicone varnish and baked. This class H insulation will withstand temperatures up to 180°C. Cooling is by a fan passing 600 cu ft of air per minute over the windings.



Portable Welders "Fararc 240" welding set

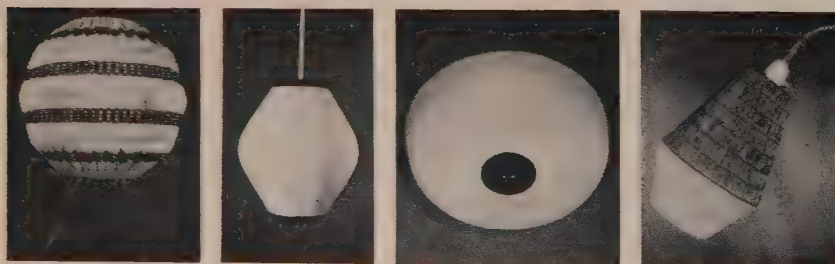
There is a thermostatic switch which, in the event of overheating, cuts off the welding current but leaves the fan working, allowing the set to cool down rapidly.

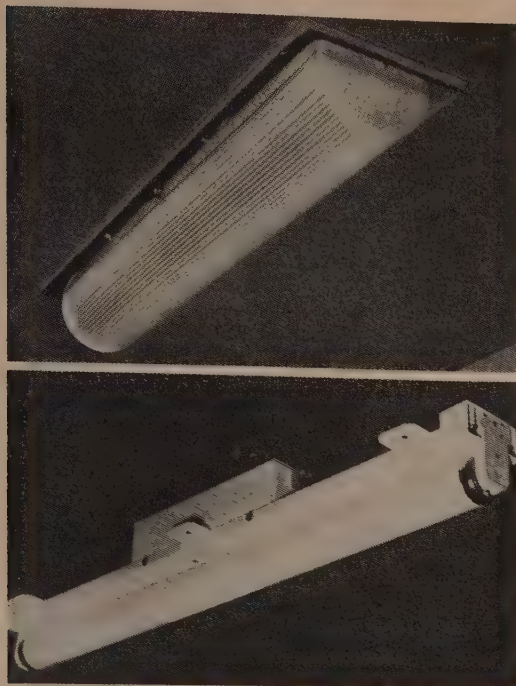
Further details can be obtained from the manufacturers, PORTABLE WELDERS, LTD., Castle Mills, Buckingham.

Low Voltage Fluorescent Fitting

The new C.32 fluorescent lighting unit introduced by EASCO ELECTRICAL (HOLDINGS), LTD., 6 & 8, Brighton Terrace, Brixton, London, S.W.9, is designed for operation from either 12 or 24 V batteries and is suitable for such applications as public transport vehicles, boats, caravans, etc. The fitting incorporates a single 2ft 20 W tube, an opal "Perspex" diffuser and

G.B.M. range of Danish lighting fittings. Left to right: floor standard, lantern, ceiling light and pendant





Easco C.32 fluorescent fitting shown with and without diffuser

a transistorised control unit. This control unit can be independently mounted if required and the fitting is so designed that the diffuser and its chromium plated retaining frame can be dispensed with if desired. Because of instant start circuitry, the lamp is claimed to reach full brilliance within approximately one second of being switched on.

All metal parts are of steel, rust inhibited and stove enamelled white. The weight of the unit, including diffuser and frame, is 5 lb. The price, complete, is £11 12s 6d plus 2s 1d purchase tax for the tube. Without diffuser and frame the price is £9 10s.

Electric Heating Fabric

An electric heating element for applications where heat is to be distributed at relatively low temperatures over large areas has been announced by HUNTING MHOGLAS, LTD., Cradock Road, Luton, Beds. The "Mhoglas" element consists of a fabric woven from glass fibre strands, each comprising approximately 120 continuous fine mono-filaments having a thin even coating of colloidal fine graphite. The fabric is bonded with a heat-resistant resin to lock the graphite and protect it during subsequent handling processes, the finished element being thin, lightweight, tough and flexible.

Elements can be manufactured to give any desired degree of resistance from 4 to 150 Ω per square, but most requirements can be met from the standard 20/40 Ω range by appropriate cutting. The normal running temperature of this range is up to 100°C above ambient, but a high-temperature element is available which can be run up to 220°C. These ranges are normally loaded up to 150 W per sq ft, but higher ratings can be permitted where there is an adequate heat dissipation rate. The applica-

tions include domestic and industrial space heating, pre-heating p.v.c. and Perspex sheeting before vacuum moulding, heating the platens of presses forming plywood sheets, and for maintaining radio and other electronic equipment between pre-set temperatures in aircraft and guided missiles.

Water-Cooled Magnetron

A water-cooled, multi-resonator, pulse operated magnetron, type M565, has been added to the range produced by the ENGLISH ELECTRIC VALVE CO., LTD., Chelmsford. This valve will deliver a peak output power of 5 MW and operates at a fixed frequency within the limits of 1,215 to 1,365 Mc/s. Suitable for high power, long range radar applications, it is designed for use with a separate electromagnet and a launching section for coupling the valve to a waveguide having internal dimensions of 6.5in by 3.25in. The cathode is oxide coated and indirectly heated, the heater voltage with no anode input power being 48 V and the heater current being 14 A.

The nominal overall length is 30in, the mounting flange diameter 10in and the net weight 72 lb approximately. Under typical operating conditions with no heater voltage, there is a magnetic field of 850 gauss and a peak anode voltage and current of 48 kV and 240 A. The pulse length is 10 μ sec and the pulse repetition rate is 250 p.p.s.

Soldering Equipment

A soldering iron stand suitable for bench or wall mounting which can accommodate a reel of solder is announced by ANGLO-NETHERLAND TECHNICAL EXCHANGE, LTD., 7/8, Idol Lane, London, E.C.3. The stand is suitable for use with the company's 230/240 V iron for which five interchangeable bits are available. The

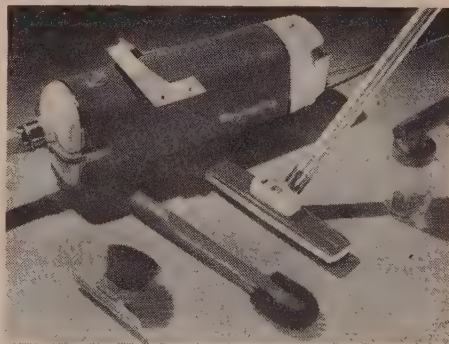
latest bit has been designed for soldering transistors and is only 0.04in (1 mm) in diameter.

New Electrolux Cleaner

A vacuum cleaner which enables the housewife to carry out all her everyday cleaning with the aid of only two tools has been developed by ELECTROLUX, LTD., 153-155, Regent Street, London, W.1. For floor cleaning purposes use is made of an accessory which combines a carpet nozzle and a floor brush. Having used the accessory in the normal way for cleaning carpets, a simple toe action on the end of the tool snaps a nylon brush into position for use as a floor brush. The whole tool can be reversed for more concentrated suction.

The other combination tool is even more ingenious. In one position it is used as a dusting brush, for carved furniture, picture rails, etc., and when reversed two wings are opened to form a small nozzle for cleaning curtains, stair carpets, or even clothes. The extension tube to which these attachments are fitted is telescopic and can be adjusted and locked to the length required for any particular cleaning job. A crevice nozzle, with a brush attachment for cleaning between radiators, Venetian blinds, etc., is also supplied, as well as a sprayer and carpet shampoo.

The cleaner itself, to be known as the "Electrolux 65," has several new features. It has a cylindrical metal body, covered in rose coloured washable vinyl, with the end pieces in ivory coloured plastic. The handle, also a plastic moulding, is located on the cleaner body at the point of balance and is so shaped that the lead can easily be wound round for storage purposes. Other refinements include nylon rollers and metal sleighs for easier manoeuvrability; cushioned grip hose handle; plastic covered tapered hose; "easy-to-open" end clips; foot switch; throw-away paper bags in addition to a cloth dust bag; air purifying pad; and a spring loop on which the cleaner can be hung when not in use. The motor, rated at 450 W, is double insulated. Including the 20ft of tough rubber two-core flexible supplied with the machine, the total weight is 13½ lb and the price, including purchase tax, is £29 11s 5d.



"Electrolux 65" vacuum cleaner

If you

manufacture

any of these

products

DRILLS; ELECTRIC SHAVERS; FANS;
FLOOR POLISHES; SPIN DRIERS;
FOOD & DRINK MIXERS; GRINDERS;
HOME CINE PROJECTORS; HAIR DRIERS;
PAINT SPRAYERS; VACUUM CLEANERS;
WASHING MACHINES, ETC.

DUBILIER

offer you a complete

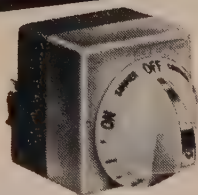
INTERFERENCE SUPPRESSION SERVICE

The knowledge and experience that Dubilier have gained from many years' work on the problems of radio and television interference are at the disposal of manufacturers of electrical equipment. We are always ready to investigate your particular problems and recommend suitable suppressors from our wide range.

DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA ROAD, NORTH ACTON, LONDON, W.3.
Telephone: ACOrn 2241 (5 lines) Telegrams: Hivoltcon London Telex: 25373 Cables: Hivoltcon London.

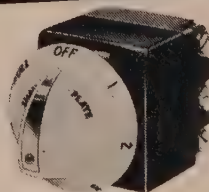
The 'Diamond H' range of Controls for domestic and Industrial applications

ENERGY REGULATORS



3 kW 250 volt AC only infinitely variable controls with indexed 'OFF' and 'FULL' positions. Single pole and double pole, single circuit: single pole two circuit types available for rear wiring and side wiring.

HEATER SWITCHES



15 amp. 250 volt AC/DC and AC only multi-heat 4/7 position flush mounting rotary reciprocating heater switches—for cookers, washing machines and other domestic appliances

THERMOSTATS



Single, two and three stage oven thermostats of the hydraulic type. Low voltage or neon pilot lights, circular escutcheons, shallow projection. Rear or side wired terminals.

PACKET SWITCHES



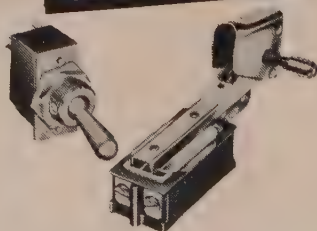
Rated at 5/60 amps. 250/600 volts, AC/DC and AC only, these switches are suitable for rectifiers, transformers, machine tools, switchboards, etc.

MINIATURE RELAYS

Series BR miniature hermetically sealed 4 pole double throw high performance relays. Extremely good shock and vibration resistance, wide temperature range. For aircraft, guided weapons, computers, etc.



TOGGLE SWITCHES



Comprehensive range available. Ratings 1.5 amps to 60 amps. 250 volt AC/DC, for aircraft, machine tools and domestic appliance applications.

*Introducing THE 80A MINIATURE SNAP-IN NEON INDICATORS

Snap-in neon indicators suitable for circular or square panel mounting holes. New miniature series — white, cream or black facia plates, —clear, amber or red lens. 1 watt, 230/250 volts, AC/DC.



'DIAMOND H' SWITCHES LTD. GUNNERSBURY AVENUE, CHISWICK, LONDON, W.4.

Telephone: Chiswick 8444 Grams: Diamonhart Chisk, London

United States Electrical Trade

ANALYSIS OF EXPORTS AND IMPORTS IN 1958

DURING 1958 the value of electrical goods exported from the United States (excluding military aid) declined slightly from £365.2 million to £359.3 million, while imports increased from £51.8 million to £57.2 million. Table 1 shows the continued prominence of Canada as the main market of the United States, although exports to Canada during 1958 dropped by about £10 million. Also of interest are the increases in the value of electrical goods shipped to Brazil and Japan. Electrical exports to the United Kingdom have increased slightly during recent years (£7.07 million in 1956; £7.71 million in 1957; and £8.02 million in 1958), but imports into the United States from the United Kingdom have fallen (as shown in Table 2) from £9.3 million in 1956 and £12.6 million in 1957 to £8.7 million in 1958.

TABLE 1.—UNITED STATES ELECTRICAL EXPORTS
PRINCIPAL MARKETS

Country	Value (£000)	Country	Value (£000)
United Kingdom ...	8,018	West Germany ...	4,227
Canada ...	78,203	Switzerland ...	2,422
Mexico ...	19,106	Spain ...	2,177
Guatemala ...	1,709	Italy ...	7,627
El Salvador ...	1,322	Turkey ...	2,066
Honduras ...	635	Lebanon ...	955
Nicaragua ...	685	Iraq ...	762
Costa Rica ...	911	Iran ...	2,683
Panama ...	1,144	Israel ...	2,017
Cuba ...	18,661	Kuwait ...	783
Jamaica ...	472	Saudi Arabia ...	1,536
Dominican Republic ...	2,373	India ...	2,778
Colombia ...	3,553	Pakistan ...	1,299
Venezuela ...	23,917	Thailand ...	1,273
Ecuador ...	1,011	Vietnam, Laos and Cam- bodia ...	1,944
Peru ...	5,154	Indonesia ...	1,270
Chile ...	4,922	Philippines ...	5,726
Brazil ...	12,044	Korea ...	2,427
Uruguay ...	532	Taiwan ...	1,533
Argentina ...	10,423	Japan ...	7,938
Sweden ...	3,066	Australia ...	3,007
Norway ...	545	Morocco ...	393
Holland ...	2,173	Belgian Congo ...	671
Belgium-Luxembourg ...	3,033	South Africa ...	3,543
France ...	5,503		
Denmark ...	789		

TABLE 2.—UNITED STATES ELECTRICAL IMPORTS
PRINCIPAL SUPPLIERS

Country	Value (£000)	Country	Value (£000)
United Kingdom ...	8,706	France ...	1,966
Canada ...	6,453	West Germany ...	14,137
Sweden ...	1,093	Austria ...	622
Denmark ...	535	Switzerland ...	3,331
Holland ...	3,655	Italy ...	1,782
Belgium-Luxembourg ...	903	Hong Kong ...	795
		Japan ...	10,034

TABLE 3.—UNITED STATES ELECTRICAL EXPORTS
PRINCIPAL PRODUCTS

Product	Value (£000)	Product	Value (£000)
Generators, d.c. ...	485	Arc welders, d.c. ...	2,206
Canada ...	84	Canada ...	256
Generators, a.c. ...	1,344	Mexico ...	257
Canada ...	262	Venezuela ...	226
Iran ...	152	Brazil ...	158
Japan ...	75	Arc welders, a.c. ...	661
Generator sets, steam tur- bine, 500 to 7,500 kW ...	2,113	Resistance welding sets ...	711
Mexico ...	209	Generator sets, diesel ...	6,956
Brazil ...	401	Peru ...	213
Cuba ...	462	Mexico ...	591
Canada ...	153	Cuba ...	392
Ditto, over 7,500 kW ...	5,998	Venezuela ...	1,006
West Germany ...	262	Brazil ...	416
Philippines ...	343	Argentina ...	359
Italy ...	1,193	Sweden ...	358
Israel ...	1,194	Iran ...	349
Japan ...	2,037	Vietnam ...	373

West Germany was again the largest single supplier of electrical products but, with the United Kingdom, lost ground in favour of Japan, whose exports to the U.S.A. increased by no less than 80 per cent over 1957. These were mainly radio receivers and non-specified electronic products and their components as shown in Table 4, and the United States is now by far the most important single market for Japanese electronic products. The trade figures shown in Tables 3 and 4 cover principal products and countries only and are based on all exports individually valued at \$500 and over, and imports at \$250 and over. Table 3 gives a striking picture of the world-wide trade of the United States, and shows the prominence of domestic and electronic appliances.

TABLE 3.—(continued)

Product	Value (£000)	Product	Value (£000)
Generator sets, self-con- tained, excluding diesel, over 0.75 kW ...	3,422	Testing and measuring in- struments, etc. (cont.)	
Canada ...	273	Italy ...	129
Venezuela ...	825	Japan ...	261
Korea ...	91	West Germany ...	221
Mexico ...	223	Australia ...	113
Batteries, storage, lead acid	1,163	Measuring and indicating instruments, non-record- ing, n.e.s. ...	1,253
Ditto, n.e.s.-cell ...	612	Canada ...	373
Batteries, flashlight, cell ...	1,452	France ...	44
Batteries, dry, multiple-cell	1,413	Motors, under $\frac{1}{2}$ h.p. ...	1,493
Capacitors, power ...	293	Canada ...	602
Transformers, power, not over 500 kVA ...	2,533	Mexico ...	468
Cuba ...	369	Motors, $\frac{1}{2}$ to 1 h.p. ...	103
Venezuela ...	582	Ditto, 1 to 200 h.p. ...	4,405
Taiwan ...	188	Canada ...	580
Ditto, over 500 kVA ...	2,868	Mexico ...	674
Mexico ...	311	Venezuela ...	424
Cuba ...	474	Chile ...	152
Venezuela ...	510	India ...	93
Brazil ...	436	Philippines ...	78
Peru ...	190	Ditto, above 200 h.p. ...	3,783
Transformers, instrument	600	Canada ...	102
Fluorescent ballasts ...	1,243	Mexico ...	813
Regulators ...	701	India ...	176
Transformers, speciality ...	852	Japan ...	462
Transformer and regulator parts ...	679	Electric propulsion motors for land vehicles ...	7,398
Rotary converters up to 150 kW ...	773	Canada ...	3,285
Canada ...	123	Argentina ...	675
Mexico ...	85	Brazil ...	419
Ditto, above 150 kW ...	2,392	Australia ...	522
Chile ...	275	Spain ...	482
India ...	325	Ditto, parts and accessories	2,736
Rectifiers, non-rotary ...	1,836	Canada ...	887
Canada ...	600	Mexico ...	175
Japan ...	83	India ...	335
Primary switchboards, panels and parts above 750 V ...	6,636	South Africa ...	123
Canada ...	344	Motor controls and parts special purposes, n.e.s. ...	2,323
Mexico ...	629	Canada ...	352
Cuba ...	438	Mexico ...	766
Venezuela ...	1,352	Chile ...	243
Argentina ...	824	Italy ...	181
Spain ...	278	Argentina ...	109
India ...	173	Portable tools, metal working ...	1,783
Japan ...	351	Canada ...	778
Secondary switchboards, panels and parts below 750 V ...	1,988	Venezuela ...	103
Circuit-breakers, oil, and parts ...	1,922	Ditto, n.e.s. ...	1,553
Ditto, others ...	6,778	Canada ...	835
Canada ...	1,679	Ditto, parts n.e.s. ...	1,288
Mexico ...	870	Canada ...	744
Cuba ...	464	Household refrigerators ...	16,635
Venezuela ...	211	Canada ...	4,288
Brazil ...	266	Cuba ...	1,589
Peru ...	533	Venezuela ...	2,989
Fuses and fuse plugs ...	572	Peru ...	533
Lightning arrestors and chokes ...	682	South Africa ...	662
Watthour meters ...	572	Lebanon ...	432
Indicating instruments, non-recording ...	1,253	Iran ...	536
Canada ...	373	Freezers, farm and home... Canada ...	3,987
Recording instruments ...	498	Sweden ...	2,846
Testing & measuring instru- ments and parts, n.e.s. ...	4,451	Household refrigeration units ...	198
Canada ...	1,122	Refrigeration and freezer parts ...	372
France ...	319	Canada ...	3,428
		Mexico ...	1,377
		France ...	345
			87

(Continued on next page)

United States Electrical Trade. TABLE 3.—(continued)

Product	Value (£000)	Product	Value (£000)
Refrigeration—continued		Cathode ray tubes ...	5,537
Philippines ...	93	Canada ...	62
South Africa ...	186	Brazil ...	577
Flashlights ...	465	Argentina ...	1,633
Fans ...	1,763	Italy ...	1,351
Canada ...	261	France ...	23
Mexico ...	173	Electronic capacitors ...	1,922
Cuba ...	182	Canada ...	483
Venezuela ...	361	Mexico ...	233
Bulbs, lamps, small filament		Argentina ...	246
miniature small base ...	2,345	Electronic resistors ...	1,377
Cuba ...	115	Canada ...	252
Canada ...	672	Electronic inductors, trans-	
Ditto, large base and fila-		formers and coils ...	1,766
ment ...	1,263	Canada ...	228
Canada ...	262	Argentina ...	483
Cuba ...	152	Italy ...	218
Venezuela ...	163	Loudspeakers ...	779
France ...	64	Electronic components	
Fluorescent lamps ...	1,589	n.e.s. ...	11,408
Household washing mach-		France ...	386
ines, non-automatic ...	1,052	Canada ...	3,584
Canada ...	218	Mexico ...	643
Venezuela ...	418	Argentina ...	915
Peru ...	52	Italy ...	259
Lebanon ...	49	Brazil ...	586
Ditto, semi- or fully-		Carrier current equipment	
automatic ...	2,953	and parts ...	810
Canada ...	1,255	Canada ...	171
Guatemala ...	43	Mexico ...	93
Peru ...	36	Telegraph apparatus and	
Venezuela ...	672	parts ...	3,994
Ditto, parts ...	1,926	Canada ...	982
Canada ...	1,012	Cuba ...	484
Mexico ...	398	Venezuela ...	179
South Africa ...	148	Turkey ...	363
Electric laundry equipment		Telephone instruments ...	512
and parts ...	386	Telephone equipment and	
Household vacuum cleaners		parts ...	11,446
Canada ...	1,326	United Kingdom ...	936
Ditto, parts ...	1,189	Canada ...	2,336
Household dishwashers ...	428	Cuba ...	3,588
Canada ...	642	France ...	436
Mixers, juicers and		Venezuela ...	437
blenders, household ...	429	Recorders, all kinds ...	4,357
Canada ...	1,556	Canada ...	1,138
Other motor-driven house-		United Kingdom ...	498
hold appliances ...	2,882	Iran ...	48
United Kingdom ...	95	Bells, buzzers, alarms and	
Canada ...	1,450	parts ...	1,011
Mexico ...	110	Starting and lighting equip-	
Switzerland ...	143	ment for cars and in-	
Italy ...	74	dustrial engines ...	10,558
Belgium ...	43	Canada ...	2,883
Flat irons ...	463	Mexico ...	861
Venezuela ...	168	Venezuela ...	763
Cookers, household, over		Brazil ...	511
2.5 kW ...	956	Iron and steel conduit ...	1,663
Canada ...	183	Conduit fittings, outlets	
Cuba ...	272	and switchboxes ...	2,249
Ditto, parts ...	1,488	Cuba ...	127
Canada ...	998	Canada ...	513
Household storage heaters		Venezuela ...	228
Household appliances n.e.s.		Pole line, distribution and	
Household heating appli-		transmitting equipment ...	3,255
cances n.e.s. ...	792	Canada ...	956
Furnaces, melting, refining		Cuba ...	298
Canada ...	973	Brazil ...	182
Mexico ...	238	Interior wiring devices ...	3,998
Japan ...	76	Canada ...	1,192
Ditto, heat treating ...	361	Cuba ...	128
Heating units and devices,		Venezuela ...	213
industrial ...	922	Fluorescent lighting fix-	
Canada ...	1,453	tures ...	487
X-ray tubes and valves ...	452	Incandescent lighting fix-	
X-ray apparatus and parts		tures ...	1,019
Canada ...	533	Portable incandescent lamps	
Mexico ...	2,953	Insulated cables and wires	
Cuba ...	933	for building ...	1,136
Venezuela ...	103	Venezuela ...	83
Colombia ...	274	Canada ...	119
Radio and TV transmitting		Cuba ...	158
equipment and parts ...	101	Wires and cables, com-	
Canada ...	1,163	munication and signal ...	2,011
Mexico ...	109	Canada ...	169
Brazil ...	94	Cuba ...	103
Finland ...	195	Turkey ...	93
Japan ...	89	Korea ...	483
Car radio receivers ...	85	Portable cord, wires and	
Canada ...	685	cables ...	479
Mexico ...	155	Wires, cables, rubber-	
Venezuela ...	127	covered, plain, braided,	
Radio receivers, n.e.s., not		excl. those for building	
incorporating TV sets ...	148	Canada ...	1,587
Canada ...	1,813	Canada ...	135
Cuba ...	482	Mexico ...	73
TV receivers ...	183	Pakistan ...	179
Canada ...	7,216	Cuba ...	87
Venezuela ...	1,736	Wires and cables, varnish	
Canada ...	1,956	cambric insulated ...	228
Switzerland ...	649	Power cables, leaded or	
Iran ...	201	armoured ...	43
Electronic receiving tubes		Wires and cables, insulated	
Canada ...	432	n.e.s. ...	2,512
Mexico ...	6,401	Canada ...	927
Australia ...	1,780	Steam turbines ...	2,884
Brazil ...	612	Canada ...	446
Argentina ...	214	Mexico ...	341
Italy ...	676	Cuba ...	65
TV camera tubes ...	844	Japan ...	1,455
	338	Brazil ...	44
	622		

TABLE 3.—(continued)

Product	Value (£000)	Product	Value (£000)
Water turbines ...	3,189	Nuclear reactors, all types	133
Steam and water engines,		Venezuela ...	5
turbine parts ...	5,687	Spain ...	11
Canada ...	1,344	Italy ...	111
Mexico ...	275	Ditto, parts and accessories	468
Venezuela ...	1,033	Sweden ...	71
Cuba ...	113	Holland ...	82
Italy ...	348	Italy ...	169
Saudi Arabia ...	427	Japan ...	64
Japan ...	582		

TABLE 4.—UNITED STATES ELECTRICAL IMPORTS
PRINCIPAL PRODUCTS

Product	Value (£000)	Product	Value (£000)
Generators and parts n.e.s.	1,883	Telegraph apparatus n.e.s.	312
United Kingdom ...	935	United Kingdom ...	62
Canada ...	72	West Germany ...	112
West Germany ...	745	Telephone apparatus ...	1,232
Austria ...	72	United Kingdom ...	105
Transformers and parts ...	2,726	Sweden ...	83
United Kingdom ...	1,406	Belgium ...	155
West Germany ...	77	West Germany ...	232
Austria ...	293	Switzerland ...	167
Switzerland ...	402	X-ray tubes ...	101
Italy ...	184	Photo-cell and electronic	
Converters, generators,		tubes n.e.s. ...	191
etc., dynamotors and		United Kingdom ...	55
parts n.e.s. ...	322	Canada ...	58
United Kingdom ...	123	Lead acid type storage	
Canada ...	51	batteries and parts ...	127
West Germany ...	48	United Kingdom ...	42
Japan ...	69	Sweden ...	29
Articles n.e.s. for con-		West Germany ...	33
trolling and rectifying		Storage batteries and	
electrical energy ...	2,216	parts, except lead acid	281
United Kingdom ...	322	United Kingdom ...	22
Canada ...	648	Sweden ...	112
Holland ...	88	West Germany ...	36
France ...	107	Flashlights and cases ...	402
West Germany ...	203	West Germany ...	78
Switzerland ...	467	Hong Kong ...	282
Japan ...	245	Japan ...	36
Motors, below 1/10 h.p. ...	269	Furnaces, heaters, ovens	
United Kingdom ...	10	and parts ...	633
Canada ...	49	United Kingdom ...	66
Japan ...	105	Canada ...	69
Ditto, 1/10 to 200 h.p. ...	879	West Germany ...	206
United Kingdom ...	774	Steam turbines, U.K. only	11
Canada ...	19	Ditto, parts ...	36
Belgium ...	40	United Kingdom ...	27
Ditto, 200 h.p. and over ...	109	Italy ...	5
United Kingdom ...	50	Washing machines ...	32
Canada ...	35	Electrical machinery and	
Ditto, parts ...	89	parts n.e.s. ...	31,214
United Kingdom ...	32	United Kingdom ...	7,806
West Germany ...	30	Canada ...	3,014
TV cameras, apparatus and		Sweden ...	462
parts ...	372	Holland ...	2,392
Radio apparatus and parts		Belgium ...	503
United Kingdom ...	9,981	France ...	932
Canada ...	891	West Germany ...	9,825
Holland ...	899	Switzerland ...	1,955
West Germany ...	832	Italy ...	1,511
Japan ...	1,243	Japan ...	1,566
	5,752		

Drawing Office Lighting

A PAPER surveying drawing office lighting requirements, prepared by Messrs. J. B. Collins and F. J. Langdon, was presented at a recent meeting of the Illuminating Engineering Society.

Offices using general lighting supplemented by local lamps on the boards were compared with others using general lighting only, and offices lit by fluorescent lamps with those using tungsten filament lighting. The authors stated that although general lighting was becoming common practice, there was no evidence that it was more satisfactory than local lighting. The absence of local adjustable lamps resulted in more complaints of glare and over-brightness. More care was necessary in designing general lighting installations than those supplemented by local lamps.

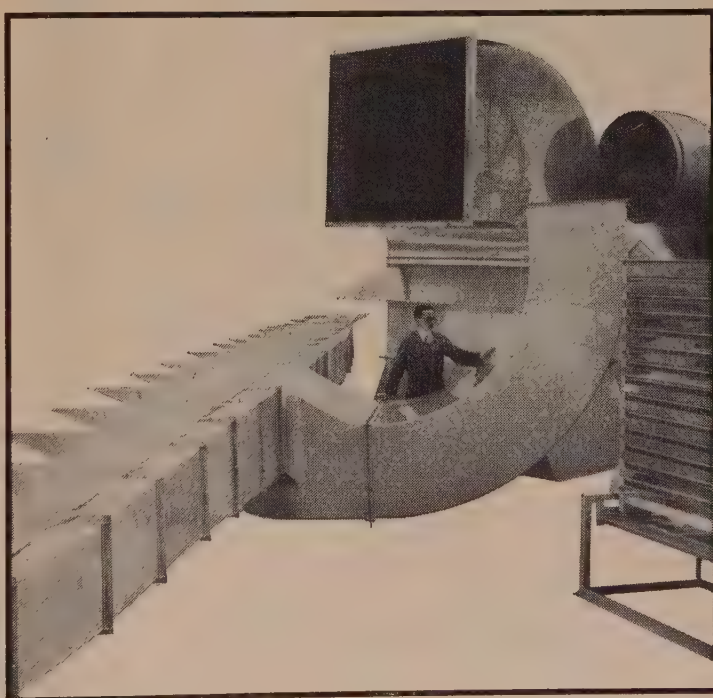
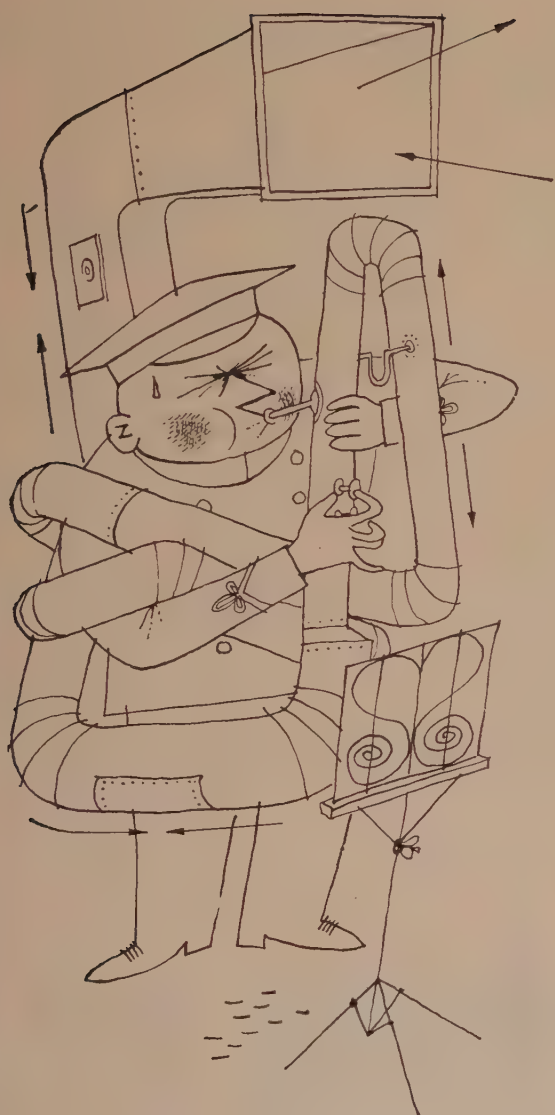
The chief requirement for daylighting appeared to be well-diffused light with a minimum daylight factor of 5 per cent. For artificial lighting, satisfactory conditions were best provided by a general illumination level of from 25 to 30 lm/ft² from low brightness fittings giving a moderately bright ceiling, supplemented by local adjustable lamps. For a purely general lighting system, the overall level of illumination should be not less than 50 lm/ft², with even light distribution.

DUCTING BY *Braby*

for Heating, Ventilation, Air Conditioning and Dust Extraction

When it comes to ducting, we don't need to blow our own trumpet. Many of the top brass in industry are loud in their acclamation of Braby ducting in plain and galvanised steel, or aluminium, whether used for small indoor systems or the largest outdoor installations.

Braby for Fabricated Metal Plate and Sheet Metal Work of all descriptions.



FREDERICK *Braby* & COMPANY LIMITED

LONDON: 352-364 Euston Road, London, N.W.1
Telephone: EUSlon 3456

GRAYFORD • GLASGOW • LIVERPOOL • BRISTOL • BELFAST • PLYMOUTH

AP159

THE NEW Mazda Netabulb MEANS BIGGER SALES FOR YOU!



RIGHT, BRIGHT, AND VERY VERY NEW

It's right because of its new compact shape. The Mazda Netabulb is absolutely right for modern light fittings. It looks right, fits right, because it's so much smaller than ordinary bulbs.

It's bright because of its coiled-coil filament. The Mazda Netabulb gives a lot more light than ordinary single-coil bulbs (and because of its white interior coating it gives a lot more comfortable light).

It's very very new. Altogether the Mazda Netabulb is so new it's a revolution

60 watt Silverlight . . . 2/8½d
100 watt Silverlight . . . 2/11½d
150 watt Silverlight . . . 2/10d
150 watt Pearl . . . 2/3d.

READ ALL ABOUT IT Ask your dealer for the Mazda booklet 'Netabulb in your home'.

Product tests have already shown that 4 out of 5 housewives prefer Netabulb — the most important step in bulb design for 30 years!

Backed by intensive advertising campaign

For the next 2½ months, at least three-quarters of the housewives in your neighbourhood will see Mazda Netabulb advertisements:

ON TV

Concentrated 5- and 30-second spots on all stations. Featured in advertising magazine programmes.

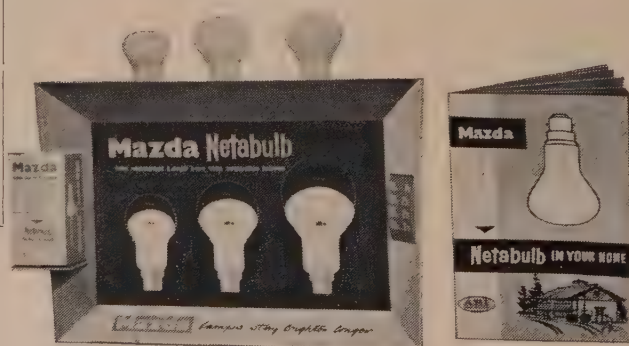
IN PRESS

Large-space advertisements in huge-circulation women's magazines:

Woman's Illustrated Woman's Own Woman's Day Woman's Realm Woman's Weekly

In Radio Times, and in Provincial Press too, outside TV areas.

Stock and display with Netabulbs to satisfy the tremendous demand this powerful advertising will bring. Contact our representative who will book you a complete window dressing; ask also for special showcards and eye-catching point-of-sale material, and for the Mazda give-away booklets 'Netabulb in your home'. Or, if more convenient for you, write direct to the Publicity Dept., A.E.I. Lamp & Lighting Co. Ltd., 44 Fitzroy Road, London, N.W.1.



STOCK AND DISPLAY Netabulb NOW!

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

MONDAY, 18th JANUARY

Birmingham.—Grand Hotel. Birmingham Electric Club. "Recent Progress in the Development and Application of Automatic Arc Welding," by P. Shaw.

Bristol.—Grand Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. "Escalators," by R. E. Lambert.

At Gardiner, Sons & Co., Ltd. I.E.S. Bath and Bristol Centre. "Lighting and other things in Moscow and Leningrad," by A. G. Penny.

Cardiff.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "The Design of Electro-Mechanical Auxiliaries directly associated with Power-Producing Reactors," by A. E. Harwood, P. Scott and B. H. Stonehouse.

Ipswich.—Electric House, 7.15 p.m. Ipswich and District Electrical Association. President's address, by H. C. Waters.

Liverpool.—Donnan Laboratories, Vine Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Radio Aspects of the International Geophysical Year," by Dr. R. L. Smith-Rose.

London.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "The Reliability and Economy of Cable Installation," opened by W. Holttun.

Manchester.—Engineers' Club, Albert Square, 7 p.m. I.E.E. North Western Graduate and Student Section. "Forum."

Newcastle-on-Tyne.—Rutherford College of Technology, 6.15 p.m. I.E.E. North Eastern Measurement and Electronics Group. "Electrical Uses of Atomic Spin," by G. Phillips.

Reading.—George Hotel, King Street, 7.15 p.m. I.E.E. Reading district meeting. "Safety in the Use of Electricity in the Factory and in the Home," by S. J. Emerson.

Stafford.—Technical College, 7 p.m. I.E.E. North Staffs Sub-Centre. "The Selection of Insulation Levels and Tests for High Voltage Transformers," by G. B. Harper.

TUESDAY, 19th JANUARY

Birmingham.—Town Hall, 7 p.m. I.E.E. South Midlands Centre. Faraday Lecture, "Electrical Machines," by Dr. M. G. Say.

Coventry.—Coventry Electricity Sports and Social Club, Merrick Lodge, St. Nicholas Street. Coventry Electric Club. "Coventry Climax Competition Engines," by G. Densham.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. "Generator/Motor Problems in Pumped-Storage Installations," by J. H. Walker.

Hull.—Lecture Theatre, Y.E.B., 6.30 p.m. I.E.S. Hull Centre. "Lighting for Ships," by P. Chittenden.

Leeds.—Leeds and County Conservative Club, 6.30 p.m. I.E.E. North Midland Utilisation Group. "Submersible Pumping Plant," by H. H. Anderson and W. G. Crawford.

Liverpool.—Merseyside and North Wales Electricity Board Industrial Development Centre, 6 p.m. I.E.S. Liverpool Centre. "Lighting and other things in Moscow," by A. G. Penny.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. Discussion on "Superseding the Ratio Arms in A.C. Bridges," opened by C. G. Mayo.

Manson House, 6.30 p.m. A.S.E.E. London National Lecture. "The Electrical Association for Women," by Miss Mary George.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Measurement and Control Group. "Examples of Geoelectric Surveys," by Prof. L. S. Palmer.

Manchester College of Building, 7.15 p.m. Ministry of Works. "Underfloor Heating by Electricity," by W. N. Shires.

Motherwell.—Fraser's Restaurant, 7.15 p.m. Ministry of Works. "Space Heating by Electricity," by W. M. Stevenson.

Oxford.—Employment Exchange, 7.30 p.m. A.S.E.E. Oxford and District Branch. "Infra-Red Heating."

Portsmouth.—C.E.G.B. Offices, 6.30 p.m. I.E.E. Southern Graduate and Student Section. "Development in Lighting," by Dr. F. A. Benson.

Preston.—Demonstration Theatre, N.W. Electricity Board, 7 p.m. I.E.S. North Lancashire Group. "Lighting of the Niagara Falls," by D. J. Reed.

South Farnborough.—Queen's Hotel, 7.30 p.m. A.S.E.E. Aldershot and Districts Branch. "Your Water Supply," by R. Irvine-Hudson.

TUESDAY, 19th JANUARY to THURSDAY, 28th JANUARY

London.—Olympia. Hotel and Catering Exhibition.

WEDNESDAY, 20th JANUARY

Glasgow.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 6 p.m. I.E.E. South West Scotland Sub-Centre. "Subscriber Trunk Dialling," by D. A. Barron.

Leicester.—Bell Hotel, 7.30 p.m. Institution of Plant Engineers, Leicester Branch. "Fine Measurement," by J. R. Adams.

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "One Approach to Generalised Machine Analysis," opened by J. G. Henderson.

I.E.E. London Graduate and Student Section, 2.30 p.m. Visit to G.P.O., Mount Pleasant, E.C.1.

Newcastle-upon-Tyne.—Old Assembly Rooms, Westgate Road, 7 p.m. Institution of Production Engineers, Northern Region. Annual dinner-dance.

Nottingham.—E.M.E.B. Showroom Theatre, 7.30 p.m. A.S.E.E. Nottingham Branch. "The Future Trend of Technical Education."

Oxford.—Southern Electricity Board Service Centre, 37, George Street, 7 p.m. I.E.E. Oxford district meeting. "Electrical Installation Practice," by E. J. Sutton.

Rochester.—King's Head Hotel, 7 p.m. Institution of Plant Engineers, Kent Branch. "Group Routing and Charging Equipment," by H. E. Francis.

Rugby.—College of Engineering Technology, 6.30 p.m. I.E.E. Rugby Sub-Centre. "New Developments in Electrical Machines," by Dr. G. H. Rawcliffe.

Sheffield.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "The Influence of Consumers' Load/Consumption Characteristics on Metering Practice," by L. B. S. Golds.

Southampton.—University, 7 p.m. I.E.E. Southern Centre. "The Provision of Adequate Electrical Installations in Buildings—Commercial Buildings," by E. E. Jacobi. (Joint meeting with the Southern Association of the Institution of Civil Engineers.)

Wolverhampton.—Chamber of Commerce, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "A.C. Motor Control Gear," by S. H. Harding.

WEDNESDAY, 20th JANUARY and THURSDAY, 21st JANUARY

London.—Savoy Place, 5.30 p.m. I.E.E. Measurement and Control Section in co-operation with the British Computer Society. Discussion meetings on "Managerial and Engineering Aspects of Reliability and Maintenance of Computer Systems."

THURSDAY, 21st JANUARY

Birmingham.—The Chamber of Commerce, 10.15 a.m. Combustion Engineering Association, Midland Region. "The Case for, and

the Maintenance of, Mechanical Stokers," by H. E. Pearsall.

Blackburn.—Castle Hotel, 7.30 p.m. Institution of Plant Engineers, Blackburn Branch. "Communicating with others," by R. Gregory.

Cardiff.—Sophia Gardens Pavilion, 6.45 p.m. I.E.E. Western Centre. Faraday Lecture. "Electrical Machines," by Prof. M. G. Say.

Park Hotel, 6.30 for 7 p.m. South Wales Institute of Engineers. Annual dinner.

Chelmsford.—Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Storage and Manipulation of Information in the Brain," by Dr. R. L. Beurle.

Dublin.—Physical Laboratory, Trinity College, 6 p.m. I.E.E. Irish Branch. "The Place of Electricity in Irish Agriculture," by J. F. Bourke and M. Shiels.

Glasgow.—At the Institution of Engineers and Shipbuilders, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Micro Miniaturisation," by H. G. Manfield.

Hull.—Y.E.B. Offices, Ferensway, 6.30 p.m. I.E.E. North Midland Centre. "Domestic Electricity," by D. Hardy. (Joint meeting with Graduate and Student Section.)

Leicester.—College of Technology and Commerce, The Newarke, 7.15 p.m. Society of Instrument Technology, East Midland Section. "Instrument Research at Stewarts & Lloyds," by M. J. Hetherington.

London.—76, Mark Lane, E.C. Diesel Engineers' and Users' Association. "Oil-Engine Driven Pumping Machinery," by P. F. Morgan.

Plymouth.—Plymouth "B" Generating Station, Prince Rock, 3 p.m. I.E.E. South Western Sub-Centre. "The Deltic Locomotive," by C. M. Cock.

Southgate.—Northmet House, 3 p.m. E.I.B.A. North Metropolitan Branch. Annual general meeting.

FRIDAY, 22nd JANUARY

Coventry.—Coventry Electric Club. Ladies' night.

Crewe.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Earthing and Earth Leakage Protection of Electrical Installations," by J. A. Robbins.

Edinburgh.—The University, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Micro Miniaturisation," by H. G. Manfield.

Glasgow.—Bath Hotel. I.E.S. Glasgow Centre. Luncheon meeting.

Helsby.—A.S.E.E. Chester and District Branch. Visit to B.I.C.C., Ltd., Helsby.

Diecasting Designing

A recently produced booklet in the series of technical publications issued by Fry's Diecastings, Ltd., shows how the design of pressure diecastings can be made to give a combination of good properties, low cost and good appearance. The first section of "Designing for Diecasting" gives the basic design principles, and this is followed by an illustrated section containing the various ways in which designs can be made to save cost by reducing weight and giving maximum production speed. Finally, brief details of the activities of the company's various works are given, with a list of previous technical publications. Copies of the booklet may be obtained from the company at Merton Works, Prince George's Road, Merton Abbey, London, S.W.19.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Amesbury.—Parish Council. 27th January. Trunk road lighting equipment. (See this issue.)

Batley.—Corporation. Class "A" street lighting equipment. (See this issue.)

Costa Rica.—La Proveeduría Instituto Costarricense de Electricidad, San José. 9th February. Electric ranges, water heating tank, dishwashing machine and electric oven. (E.S.B. 30394/59.)*

Dagenham.—Corporation. Trunk road lighting equipment. (See this issue.)

Durham.—County Council. Electrical installations in schools. (See this issue.)

Fife.—County Council. 30th January. Group "A" street lighting equipment. (See this issue.)

Friern Barnet.—U.D.C. 3rd February. Street lighting lamps for year commencing 1st April next. (See this issue.)

Great Yarmouth.—Corporation. 29th January. Electric cables for one year from 1st April next. (See this issue.)

Hampshire.—County Council. 10th February. Equipment for Basingstoke Technical College. (See this issue.)

Hornsey.—Corporation. 8th February. Supply of sodium discharge lamps for the period ending 31st March, 1961.

India.—Madras State Electricity Board. 21st January. Aluminium busbars. (E.S.B. 30316/59.)* 29th January. 30 V and 220 V batteries for substations. (E.S.B. 30714/59.)* 11th February. H.v. insulators. (E.S.B. 30317/59.)*

Bombay Electricity Supply and Transport Undertaking. 3rd March. Trolley buses and overhead line equipment. (E.S.B. 29037/59.)*

Rihand Hydro-Electric Design Directorate, Kanpur. 17th February. Power and control cable for grid substations. (E.S.B. 30313/59.)*

Administrator, Durgapur Project, Calcutta. 30th March. Supply and erection of a complete thermal power station. (E.S.B. 30778/59.)*

Korea.—Government Office of Supply, Seoul. 26th January. Water softeners, five 1,000 kW diesel electric generating units, five 48 V storage batteries and five pumps. (E.S.B. 30418/59/I.C.A.)* Electrical apparatus, including oil circuit-breakers, disconnecting switches, load interrupter switches, lightning arrestors, metering outfits, current transformers and capacitor banks. (E.S.B. 30414/59/I.C.A.)* 27th January. Refrigerators, electrical apparatus, laboratory instruments and equipments. (E.S.B. 30415/59/I.C.A.)*

New Zealand.—G.P.O., Wellington. 8th February. Mercury vapour discharge lamps. (E.S.B. 30550/59.)* 15th February. Paper jointing sleeves. (E.S.B. 30551/59.)* Terminal blocks. (E.S.B. 30552/59.)* 16th February. Cadmium copper wire. (E.S.B. 30545/59.)* 17th February. Galvanised steel line wire for telegraph and telephone purposes. (E.S.B. 30546/59.)* 18th February. Insulator spindles and nuts. (E.S.B. 30549/59.)* 23rd February. Ammeters. (E.S.B. 30544/59.)* Capacitors. (E.S.B. 30547/59.)* 24th February. 600 electric torches. (E.S.B. 30750/59.)*

* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

New Zealand Electricity Department, Wellington. 8th March. Two 30 MVA, 110/33 kV transformer banks and spares. (E.S.B. 30180/59.)* 22nd March. One 20,000 kVA transformer bank and spare unit. (E.S.B. 30179/59.)*

Nigeria.—Electricity Corporation of Nigeria. 10th February. Thirty-six 150 MVA ring main units. (See this issue.)

Pakistan.—Pakistan Posts and Telegraphs Department, Karachi. 27th January. Electric cable. (E.S.B. 30786/59.)* 7th February. Equipment for a radio station. (E.S.B. 30787/59.)*

Director-General, Department of Supply and Development, Karachi. 30th January. Six slip-ring motors. (E.S.B. 30785/59.)*

Philippines.—Bataan Pulp and Paper Mills, Inc., Manila. 25th January. One 4,000 kW turbo-alternator. (E.S.B. 30846/59/I.C.A.)*

Saddleworth.—U.D.C. 4th February. Street lighting equipment. (See this issue.)

South Africa.—Johannesburg Corporation. 25th January. Electricity meters, current transformers and test blocks. (E.S.B. 30518/59.)*

Sudan.—Department of Posts and Telegraphs, Khartoum. 22nd February. Underground cables. (E.S.B. 30811/59.)*

Vietnam.—Vietnam-American Textile & Finishing Mills, Ltd., Saigon. 31st January. Cotton mill equipment, including two 1,000 kW diesel generator sets, steam boiler, transformer station, switchboard, etc. (E.S.B. 30565/59/I.C.A.)*

Widnes.—Corporation. 11th February. Electrical equipment, lamps, gas fittings and mantles for the year ending 31st March, 1961. (See this issue.)

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Ayr.—Factory, Heathfield; James Gilchrist, Ltd., Boswell Park.

Barnet.—Primary school, Valley Drive; Davis, Belfield & Everest, surveyors, 9, Ashley Place, S.W.1.

Barnsley.—Houses (300); borough engineer, Town Hall.

Birmingham.—Flats (270), in three sixteen-storey blocks, Perry Barr; Geo. Stubbings, Ltd., Streetly Road.

Boldon (Co. Durham).—Houses at Boldon for the U.D.C. Contractors: Gordon Durham & Co., Moor Lane, East Boldon (30); W. D. & R. Allison & Son, North Guards, Whitburn (32); and R. Brown & Son, Lord Street, South Shields (28).

Bradford.—Central library (£500,000); W. Clifford Brown, city architect.

Brierley Hill.—Supermarket, shop and office block, Odeon Cinema site (£70,000); A. M. Read, architect, Bilston, Staffs.

Cardiff.—Third stage of Llandaff Technical College; city architect.

Carlisle.—Four-storey office block; Royal Insurance Co., Ltd., North John Street, Liverpool, 2.

Chester.—New outpatients' department at the Royal Infirmary (£260,000); T. Noel Mitchell, regional architect to Hospital Board, 55, Castle Street, Liverpool, 2.

Connah's Quay.—Swimming bath and assembly hall; J. G. L. Poulson, architect, 29, Ropergate, Pontefract.

Coventry.—Junior school, Potters Green; city architect, Council House.

Durham.—Houses (72) and blocks of flats at Sands Nurseries; R. E. Coleman, Ltd., builders, 63, Western Hill, Durham.

Residential nurseries at Brandon and East Boldon; county architect, South Street, Durham.

Ellesmere Port.—Secondary school for girls (£180,370); director of education, City Road, Chester.

Fort William.—First stage of new hospital; D. Polson Hall, architect, Reay House, Inverness.

Gateshead.—Church, Kells Lane, for the Rev. Father J. Anderson; A. E. Gunning, architect, 18, Eldon Square, Newcastle-on-Tyne.

Hampshire.—County secondary school, Hedge End, Southampton; county architect, The Castle, Winchester.

Houghton-le-Spring.—Divisional stores at Lambton for Durham Coal Board (£220,000); Holland & Hannen and Cubitts, builders, Howdon-on-Tyne.

Ipswich.—Works extensions for Ransomes & Rapier, Ltd.; Taylor Woodrow, Ltd., 41, Welbeck Street, London, W.1.

Kempston.—Four-storey block of flats (£23,000), Bunyan Road; U.D.C. surveyor, Kempston, Beds.

Kirkcudbrightshire.—Secondary school, Gatehouse (£101,973); A. Caldwell, county architect, The Harbour, Stranraer.

Lancashire.—Additional classrooms, etc., at Radcliffe Boys' County Secondary School and Livesey Feniscowles County Primary School; county architect, P.O. Box 26, County Hall, Preston.

Leicester.—Works extensions; British United Shoe Machinery Co., Ltd., Grafton Street.

Liverpool.—Public laundry and baths, St. Domingo Road; city architect, Blackburn Chambers, Dale Street, Kingsway, Liverpool.

London.—Eight-storey office block, Berwick Street and Noel Street, Soho; Norman Green, architect, 12, Adeline Place, W.C.1.

Showrooms, Powis Street, Woolwich; Freeman, Hardy & Willis, Ltd., Rutland Buildings, Leicester.

Manchester.—Office block, Booth Street and Kennedy Street; J. Gerrard & Sons, Ltd., Swinton.

Mansfield.—Centre for handicapped persons in Dallas Street (£50,000); county architect, County Hall, Nottingham.

Middlesbrough.—Clinics at Carlow Street (£15,000) and Berwick Hills (£17,000); J. A. Kenyon, borough engineer.

Northants.—Additional buildings at Irthlingborough and Corby Beanfield Modern Schools, teaching block at Kettering Grammar School and laboratories, dining room and kitchen at Daventry Grammar School; county architect, Northampton.

Northumberland.—Completion of civil defence centre, Morpeth (£56,000) and additions to Prudhoe Secondary School (£20,000); county architect, County Hall, Newcastle-on-Tyne.

Nuneaton.—Shops and offices, Newdigate Street; Geo. Wimpey & Co., Ltd., Chester Road, Castle Bromwich.

Seaton Delaval (Northumberland).—Bungalows (80), Seaton Sluice; J. M. Reid & Son, builders, Hayward Avenue, Seaton Delaval.

Shillington.—County primary school (£23,175); county architect, Bedford.

Soundwell.—Swimming baths; Burrough & Hannam, architects, 23, Richmond Hill, Bristol.

Warrington.—New ward blocks, theatre extensions, maternity block, ear, nose and throat department and outpatients' department at General Hospital; regional architect, 55, Castle Street, Liverpool, 2.



KARIBA at 330 kV.

All the bushing porcelains for the 330 kV.
circuit breakers

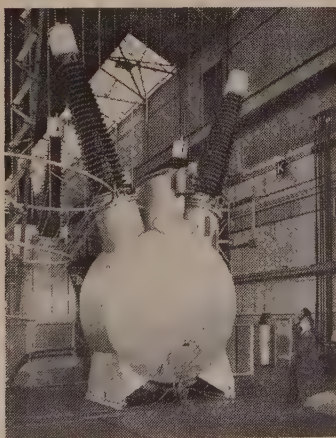
All the 330 kV. strain insulators for the
substations

and the 330 kV. post insulators for some of
the substations
by

BULLERS

MAIN CONTRACTORS · B.T.H. CO. LTD.

CONSULTING ENGINEERS · MERZ & McLELLAN.



The illustrations show a
complete 330 kV. bushing
insulator and a 330 kV.
circuit breaker, by
courtesy of the B.T.H. Co.

BULLERS LIMITED · MILTON · STOKE-ON-TRENT · STAFFS

Telephone: Stoke-on-Trent 54321

London: 6, Laurence Pountney Hill, E.C.4. Telephone: MANsion House 9971



making light work of it
AT THE NEW BOWATER PLANT
INSIDE AND OUTSIDE LIGHTING
FITTINGS BY SIMPLEX

Simplex lighting fittings installed are general purpose flood-light projectors and blended fittings.



SIMPLEX LIGHTING FITTINGS ARE INSTALLED AT THE NEW PLANT OF THE MERSEY DIVISION OF THE BOWATER ORGANISATION. Inside, high bay blended fittings were used. These fittings give colour correction to a mercury lamp by blending with a tungsten lamp. Reflectors are finished in Simplex Arvit—an acid resistant vitreous enamel. Outside, illumination is provided by a concentration of weatherproof general purpose floodlights mounted on towers. Simplex make industrial lighting fittings of every type for indoor and outdoor use and have a team of lighting specialists who will be happy to advise you on any problem.



SIMPLEX ELECTRIC CO. LTD. LIGHTING DEPT.
BLTYHE BRIDGE nr. STOKE ON TRENT STAFFS.

Branches throughout Britain and agents throughout the world.

Simplex

A  COMPANY

MAIN ELECTRICAL INSTALLATION CONTRACTORS for

**THE BOWATER
MERSEY MILL
PROJECT**

Consult us for :
HEAVY INDUSTRIAL
INSTALLATION—
OFFICES—FLATS &
HOUSING—HOSPITALS
SCHOOLS, ETC.

*In fact, anything
electrical at home
and abroad.*

Contractors to—
Admiralty, Ministry of Works,
Air Ministry, Central
Electricity Generating Boards
and other Authorities

T A N J O N

ELECTRICAL AND MECHANICAL ENGINEERS

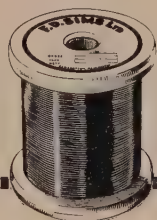
HEAD OFFICE :
31 BRIGHTON ROAD
SUTTON SURREY

PHONE: VIGILANT 0191/2/3

BRANCH OFFICE:

35 CUSTOM HOUSE CHAMBERS
QUAYSIDE
NEWCASTLE-ON-TYNE
PHONE: NEWCASTLE 23486

EQUIPMENT & SERVICES LTD.
HARLOW, ESSEX. TEL: HARLOW 24287
QUICK DELIVERY SERVICE
 = DESPATCH IMMEDIATELY AUTOMATIC TIMING
 & CONTROL EQUIPMENT INCLUDING TIMERS, RELAYS &
 CONTROL PANELS TO INDIVIDUAL SPECIFICATIONS ETC. =
 = CUSTOMER IN A HURRY.
 P.S. FORWARD FULL DETAILS OF
 QUICK DEL. SERVICE.



Quick-soldering
 (POLYURETHANE)
**ENAMELLED
 WIRES**

... a product of



P.O. Box 8 Hazelhurst Works, RAMSBOTTOM, Manchester

Telephone: Ramsbottom 2213/4/5

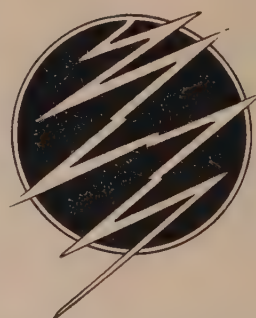
Telegrams: "SIMS" Ramsbottom

London Office and Stores:

106 Newlands Park, Sydenham London S.E. 26

Telephone: SYDenham 4211/2

S 53



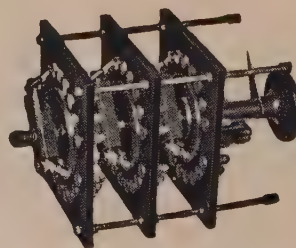
FURSE
**LIGHTNING
 CONDUCTORS**
 and Earthing Equipment

Largest Manufacturers and Exporters in
 Great Britain

Illustrated Trade Literature available upon request. Advisory and Technical
 Information Service free.

W. J. FURSE & CO. LIMITED
 33 Traffic Street (Tel. 83471-5 lines) NOTTINGHAM
 Also LONDON, MANCHESTER, BIRMINGHAM, BRISTOL

**H.B. TRANSFORMER TAPPING SWITCH
 TYPE L**



Interlocked with micro
 break switch

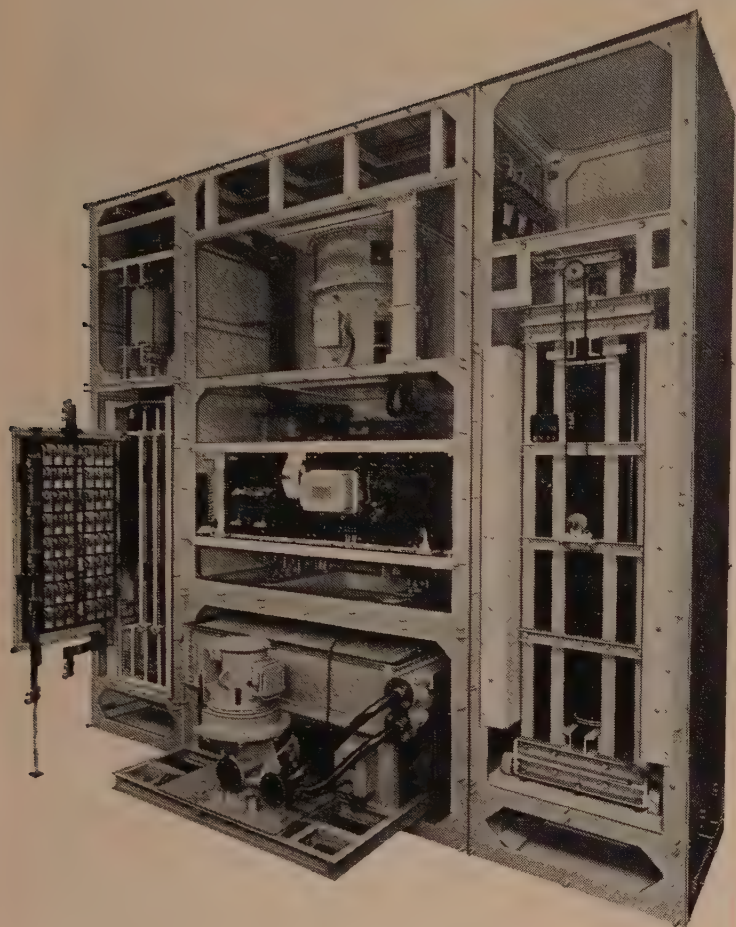
Pull Handle to re-
 lease Lock, then turn

Also Type O with-
 out interlock and
 Type C for on load
 switching

SINGLE OR MULTI POLE
 Phone: Kings Norton 1604

HENLEY BURROWES & CO. LIMITED
 Factory Centre: KINGS NORTON, BIRMINGHAM

BRENTFORD REGULATORS



FOR NEW ADMIRALTY GERMANIUM RECTIFIERS

H.M.S. Mull of Kintyre will use Brentford regulators to control voltages for rectifiers supplying d.c. to other ships. The regulator in each rectifier unit, which is built to Admiralty shock specifications by A.E.I. Ltd., feeds a buck and boost unit, stabilising the d.c. output of the whole system at 225 volts $\pm 2\%$, despite variations in load or a.c. supply voltage.

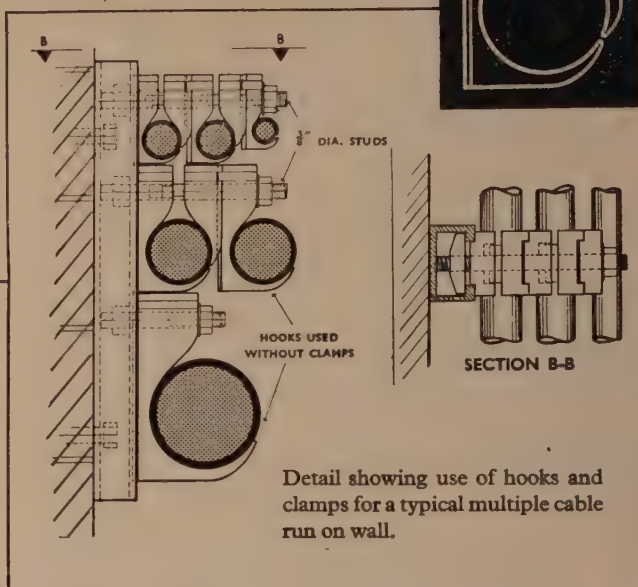
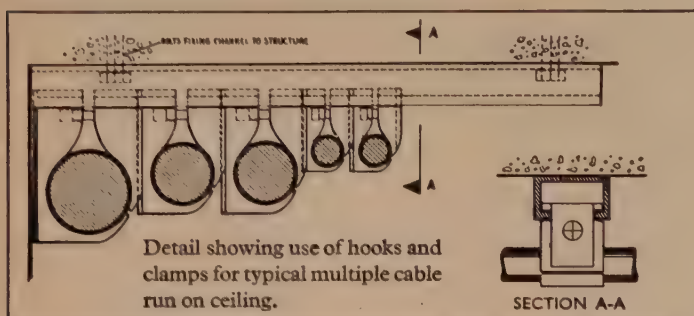


BRENTFORD  **Regulators**

THE NEW **CS** CABLE SUPPORT OUTDATES OTHER SYSTEMS

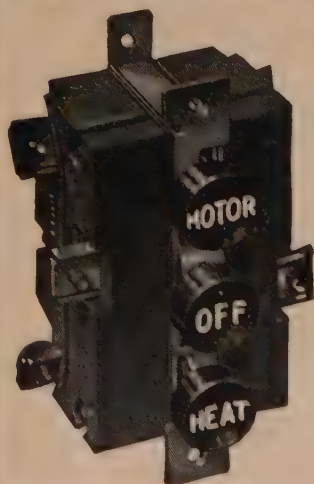
Unique feature saves labour, time and money

The unique C.S. hook section, which eliminates manual holding during fixing, is clearly shown in the diagrams. Note also how a universal channel section simplifies adaptation vertically and horizontally. All parts are in aluminium alloy to prevent electrolytic action and corrosion. Sizes cater for cables $\frac{1}{2}$ " to 3" diameter. Careful design has combined good appearance with economy—the C.S. System cuts the cost of cable installations.



WRITE FOR DETAILED INFORMATION AND PRICES TO CABLE SUPPORTS LTD., 303 BRIXTON ROAD, LONDON, S.W.9. TELEPHONE: BRIXTON 1193

FOR HEATED WASHING MACHINES



Jelson

PRESS
BUTTON
SWITCHES
ARE A

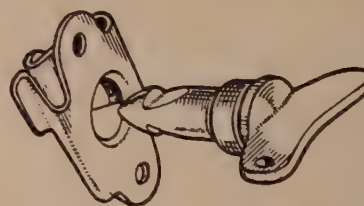
TECHNICAL ADVANCE WITH COMMERCIAL ADVANTAGE

Two AC only 15 amp 250 v. D.P. Switches in one unit—ceramic insulation. Three varieties of operation—Independent, Interlocked sequence or Interlocked changeover. With or without manually reset Thermal trip for Heating Element and/or current overload trip for protecting Motor.

We shall be pleased to send full details.

JELSON ELECTRIC LTD. PHONE: ACO. 0866
SPRING ROAD, TYSELEY, BIRMINGHAM 11

ODDIE FASTENERS



The Fastener with endless applications.
Simple, Positive, Self-locking. Made
in a variety of types and sizes.

Special Fasteners to suit customers' requirements

**WIDELY USED IN THE ELECTRICAL AND
RADIO INDUSTRY**

Department "E.R."

ODDIE, BRADBURY & CULL LTD.
SOUTHAMPTON

Telephone 55883

Cables: "Fasteners, Southampton"

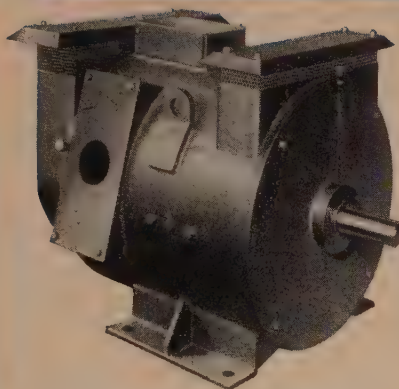
POWER AND CONTROL



E.D.C.C.
*make Motors,
Generators
and Starters
for all marine
purposes,
in standard
and special
designs.*

Illustrated here is equipment especially designed for marine duties and backed by long and successful experience in this field

This equipment complies fully with all relevant B.S. specifications, the requirements of Lloyds and British M.O.T.



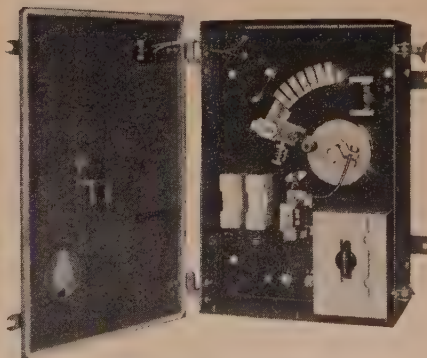
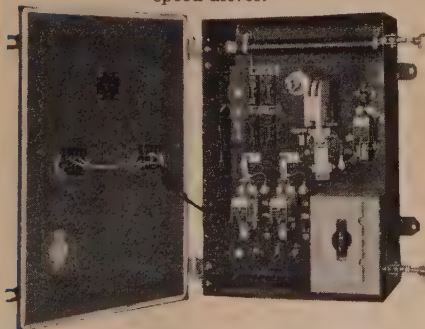
60 h.p. 220 volt D.C. Marine Motor, drip-proof enclosure.



35 kW. 220 volt D.C. Marine Generator, flange mounted for coupling to diesel engine.

Contactor Starter for D.C. motors available for constant and variable speed drives.

Hand operated Faceplate Starter for D.C. motors, available for constant and variable speed drives.

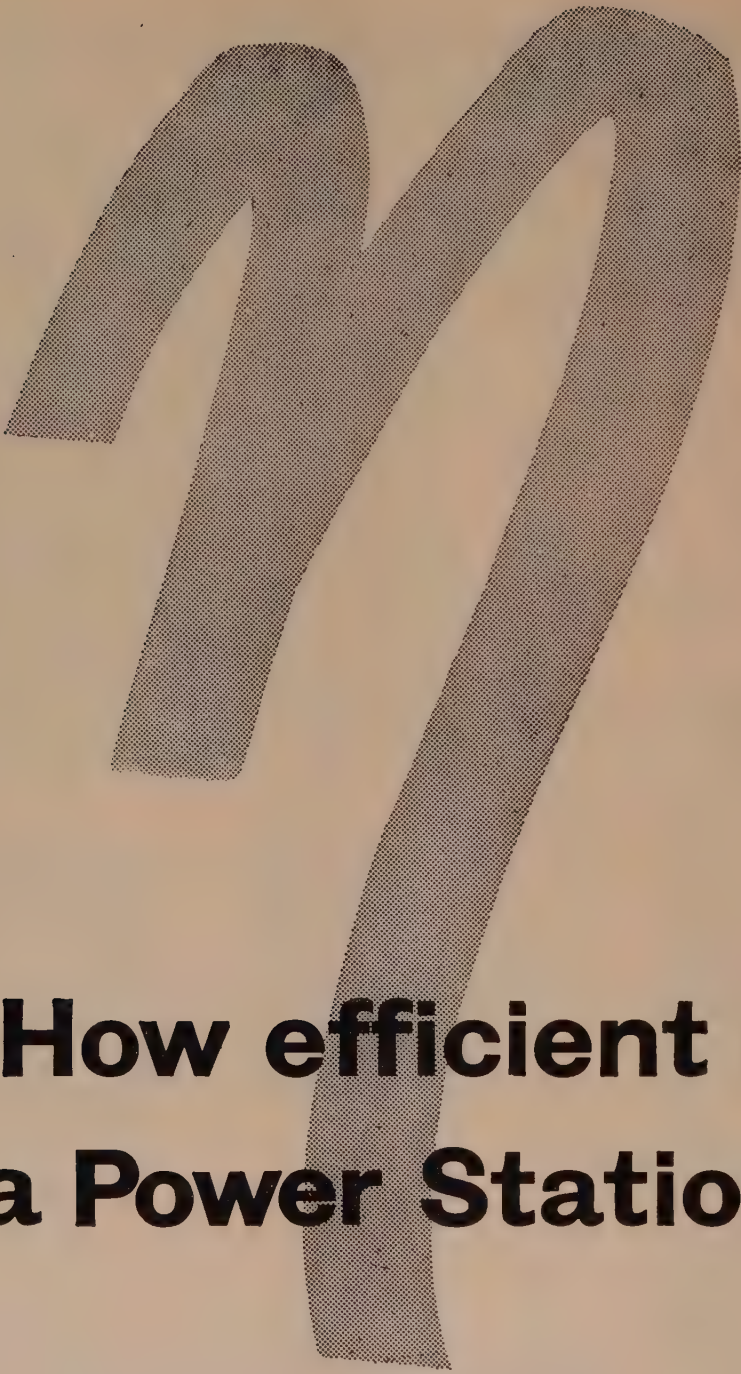


PLEASE SEND FOR FURTHER DETAILS

ELECTRO-DYNAMIC

CONSTRUCTION COMPANY LIMITED

ST MARY CRAY ORPINGTON KENT TELEPHONE: ORPINGTON 27551 TELEGRAMS: ELEDAMIC ST MARY CRAY
Control Gear Division: BRIDGWATER SOMERSET Tel: BRIDGWATER 2882 Glasgow Office: 40 HOULDSWORTH ST C3 Tel: CENTRAL 2620



How efficient is a Power Station?

The term 'efficient' is often used loosely as an alternative to 'effective'. In Electricity Supply, however, the 'efficiency' of a power station has a well-defined and exact connotation. It indicates the heat energy expended to produce a unit of electricity.

Progressively, new power stations are more 'efficient' than their predecessors — they burn less coal for a given output. The engineers of the Central Electricity Generating Board are

producing designs which, by increasing efficiency, enable power stations to offset substantially the rising costs of materials.

In spite of increased efficiency, however, the available supply of suitable coal cannot long keep pace with the demand for electricity, which doubles every decade. The gap that threatens in the not distant future will now be filled by the rapidly expanding nuclear power programme.



THE CENTRAL ELECTRICITY GENERATING BOARD



The GREENWOOD-AIRVAC Skirting Duct System

accommodates Post Office and internal telephone cables,
power and lighting wiring

DELIVERY

6" x 1½" with division

4" x 1" with division

EX STOCK

★ Supplied in 6 ft. lengths complete with requisite Tee-sections and 90° angle bends for inner or outer access

★ Can be cut on site. Extra self-tapping screws supplied for cover plate fixing

★ Electrical continuity throughout

★ Other sizes made to order

*Please write or phone for prices and further details
and the descriptive leaflet on the Greenwood-Airvac Underfloor Conduit System*

Greenwood Airvac **Conduits Ltd** 

Patentees, Designers and Manufacturers of Electrical Conduit Systems

CARLISLE HOUSE, 8 SOUTHAMPTON ROW, LONDON, W.C.1.

CHAncery 9377 (3 lines)

'Grams: Aircon, Westcent, London

Otter

REGD.
THERMOSTATS

They've got to be GOOD to be here

WORLD PATENTS INCLUDING PATENT
NUMBERS 600055, 622781, 624905, 657434,
713443, 749716, 774911, 782668 and others.
Also other patents pending.

Illus. of VANGUARD.
By courtesy of
Vickers Limited.

*Where the
H... is it
Harry?*



... You'll always find an Otter
where there's an important job
of temperature control to be
done and little or no space
allowed for it.

Otters **PRESS** their contacts
together to open them with
a **SNAP!**

OTTER CONTROLS LIMITED

Otters 'Ole, Market Street, Buxton.

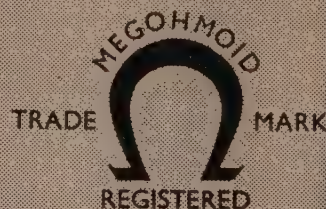
Telephone: Buxton 650 (2 lines)

MEGOHMROID

**A
specialised
service
to cable manufacturers . . .**

Lindsay & Williams
LIMITED

Proofed Insulating Cloths and Tapes for
Rubber and Power Cables
Bitumenised Hessian and Bitumenised
Cotton Tapes
Adhesive Insulating Tapes



LINDSAY & WILLIAMS LIMITED Established 1912

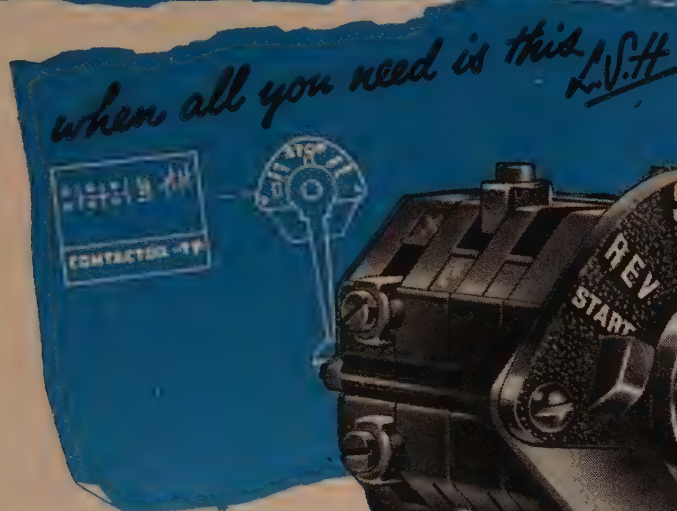
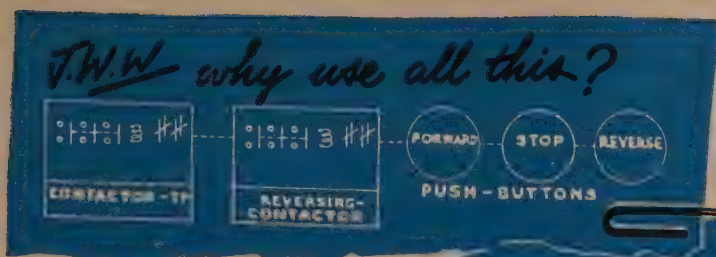
Telephone: EAST 2686 (5 lines)
"Telex 66269"

OPENSHAW BRIDGE WORKS, MANCHESTER 11

Grams:
"Megohm Telex Manchester"

The **4 in 1**
Reversing Switch
condenses 4 separate
components into one
Compact Centralised Control
Unit

Save Cost and Space
by writing for details
now



plan with
the Craig & Derricott
4 in 1 Reversing
Switch



CRAIG & DERRICOTT LTD.

ROYAL WORKS, SUTTON COLDFIELD. Tel.: Sutton Coldfield 7716/7/8

30,000

lampways
to light the new Ford

BEN7AMIN
REGD.





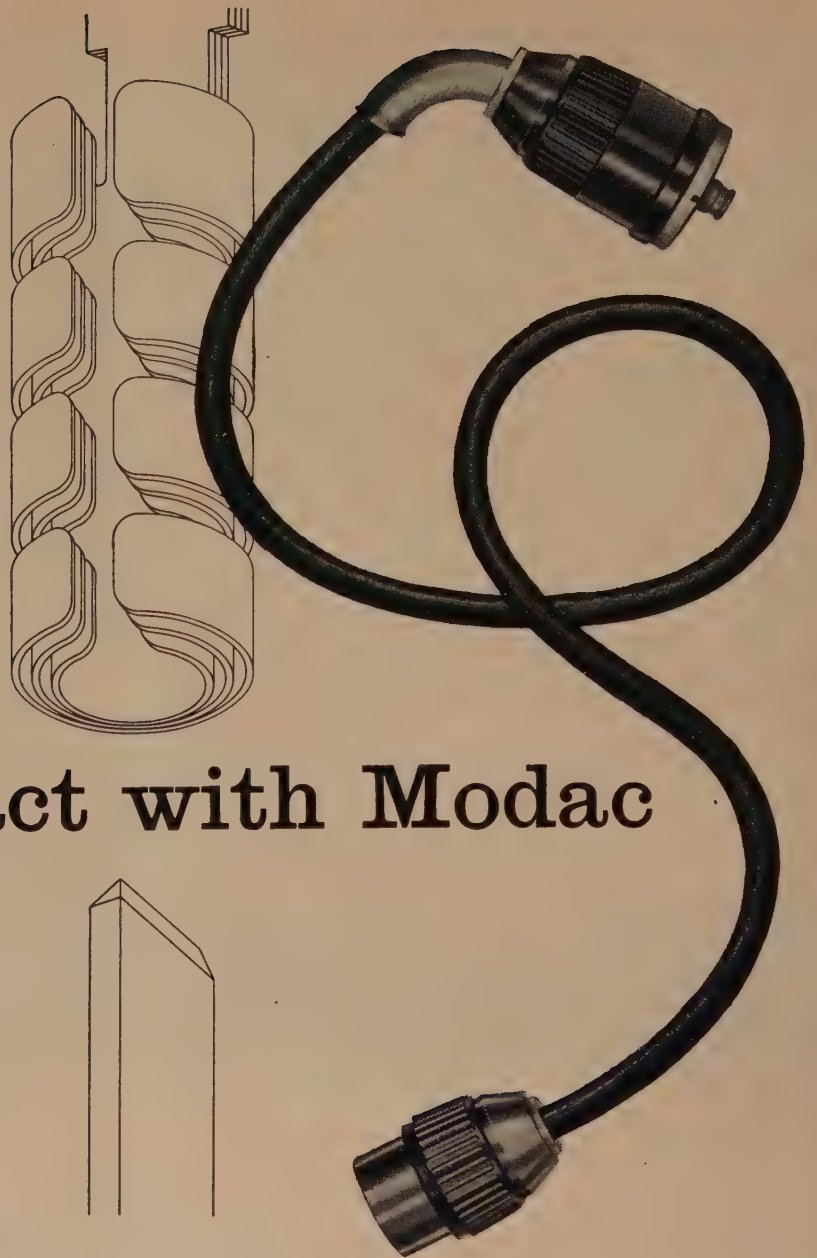
Consulting Engineers: Foxford, Pavy & Partners.

Specially designed G.E.C. trunking and Benjamin fittings provide modern lighting for the $1\frac{1}{2}$ million sq. ft. of The Ford Motor Co. Ltd. new "body in white," paint, trim and assembly buildings at Dagenham.

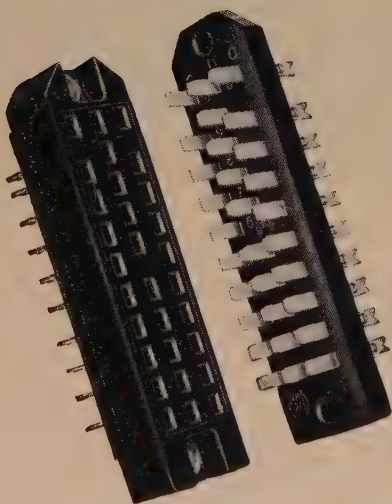
assembly plant...

Planned lighting is a vital part of modern production techniques, and whether you are building anew or re-equipping, whether your programme is a vast one or quite small, be guided by The Ford Motor Co. Ltd. and call in Britain's most experienced industrial lighting service — preferably early in the planning stage.





Make contact with Modac



Modac Connectors

**Wiring & Connectors Division
The Plessey Company Limited**

MODAC are specialists in the field of plugs and sockets and general wiring problems. They are expert in the designing of individual connectors and cable assemblies to meet, exactly and consistently, the specific requirements of the most uncommon installation, in any aspect of electrical engineering.

That is not to say, however, that Modac are unable to supply, from stock, a fully comprehensive range of connectors—from heavy duty to miniature—for use over the same broad field of application from transport to telecommunications, from nucleonics to electronics.

But whether 'off the shelf' or tailored to a customer's requirements, Modac connectors, featuring independently sprung, multi-point contacts and bevelled blades, not only minimise the effects of vibration and give low contact resistance, but are also self-cleaning. They ensure, in fact, that a Modac connection is the best that can be made—in any installation.

CHENEY MANOR • SWINDON • WILTS • Telephone: Swindon 6251

Agents for British Commonwealth Countries: Plessey International Limited • Ilford • Essex • Ilford 3040.

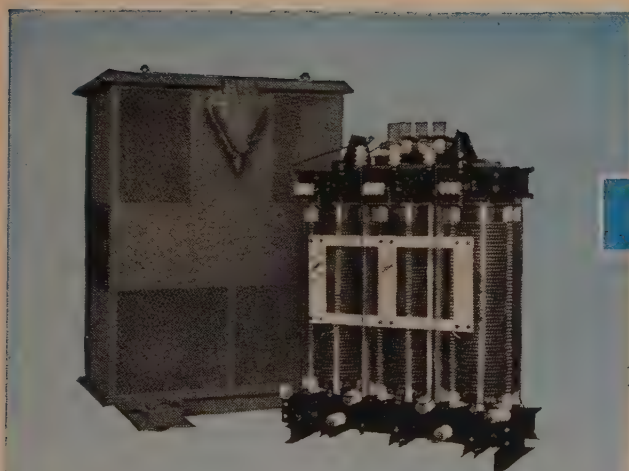
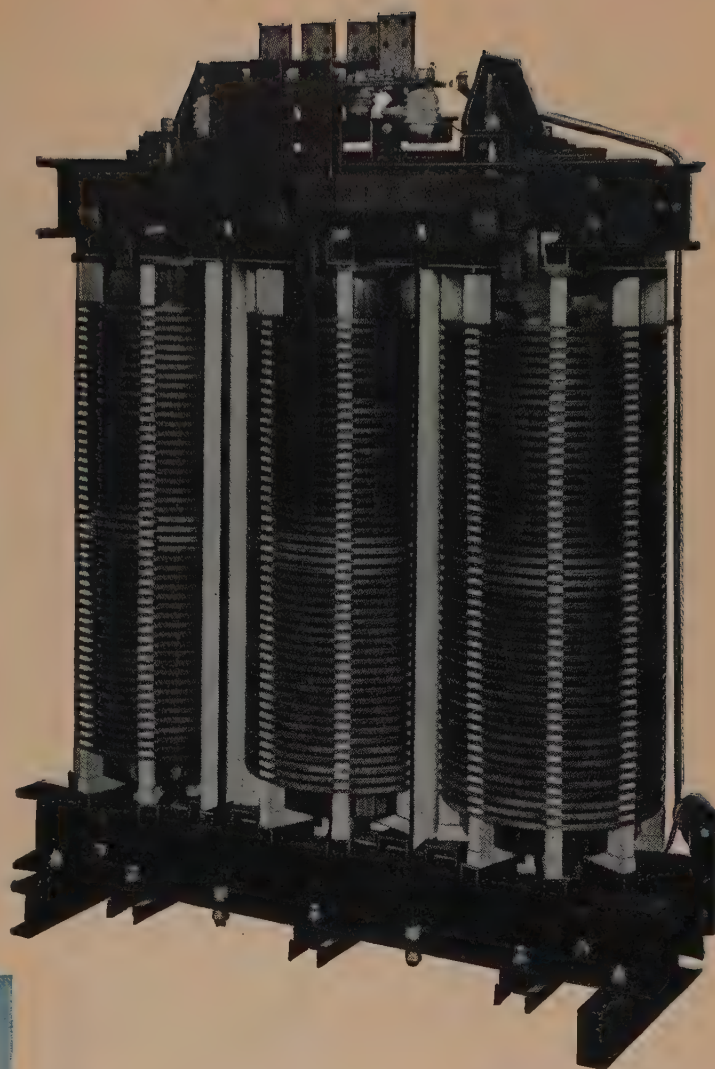
'MODAC' is a Registered Trade Mark

 MAL 3



**DRY TYPE
AIR COOLED
CLASS-C
TRANSFORMERS**

SILICONE INSULATION
SILICONE INSULATION
SILICONE INSULATION



SILICONE INSULATION

- No Fire Risk
- Reduced Weight
- Higher Overload Capacity
- Can be installed in damp locations

For any installations where fire risk is high or consequential loss would be considerable, the introduction of the dry type air-cooled Class 'C' Transformer marks another major step in security.

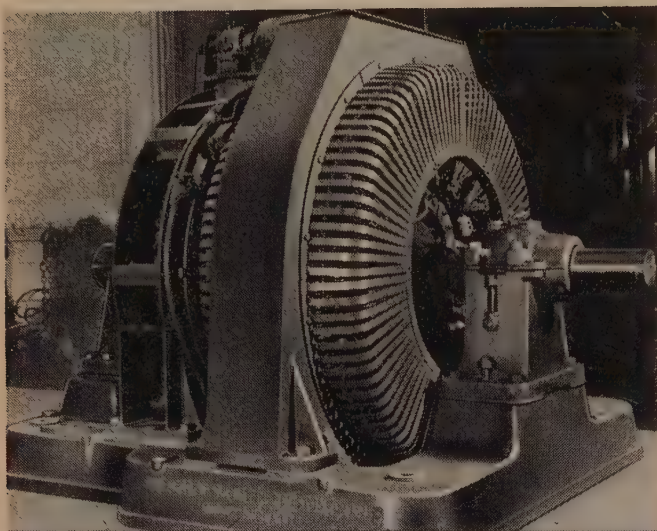
Illustrated is a 1,000kVA, 3 phase, 50 cycles, 11,000/433 volts Bryce Low Loss Distribution Transformer using Class 'C' insulation.

BRYCE ELECTRIC CONSTRUCTION CO. LTD.

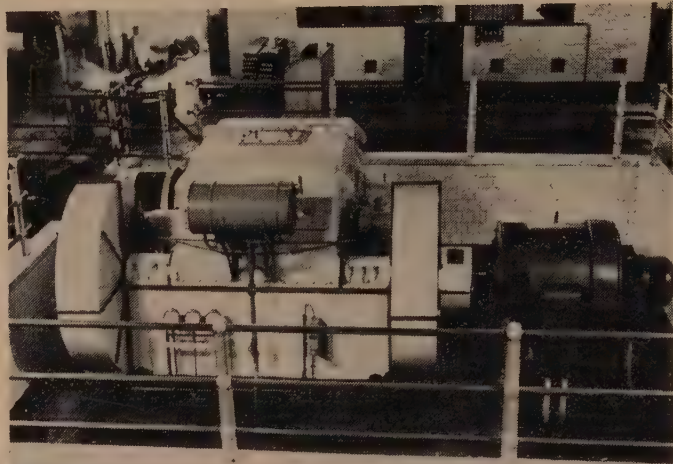
Kelvin Works, Hackbridge, Surrey. Telephone Wallington 2601

In association with Hackbridge Cable Co. Ltd.

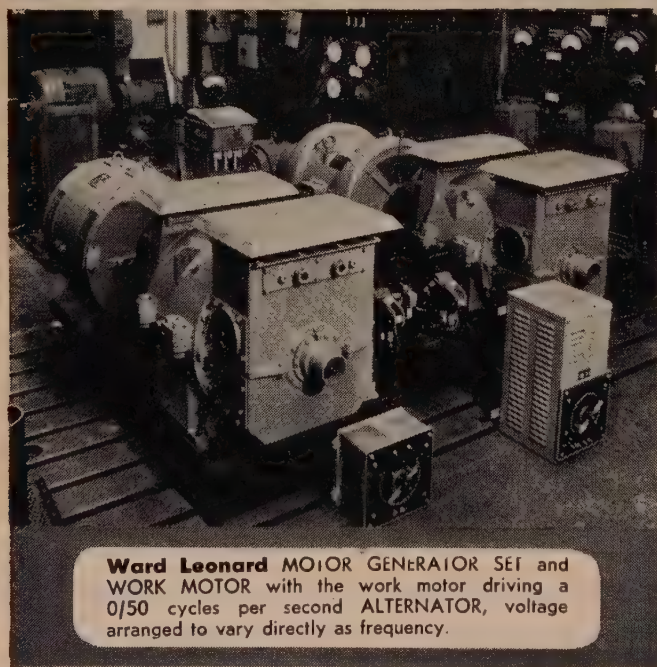
Electrical Plant for Special Applications



270/67.5 h.p. COMMUTATOR MOTOR, speed 375/95 r.p.m.



FOUR 400 h.p. ROLLING MILL MOTORS by **English Electric Co.**, 738 r.p.m. to final 30 r.p.m. With control gear.



Ward Leonard MOTOR GENERATOR SET and WORK MOTOR with the work motor driving a 0/50 cycles per second ALTERNATOR, voltage arranged to vary directly as frequency.

Send Us Your Enquiries For:

FREQUENCY CHANGER EQUIPMENT
WARD LEONARD SETS
MOTOR GENERATOR SETS
PLATING AND ANODISING GENERATORS
A.C. AND D.C. MOTORS
ALTERNATORS
WELDING GENERATORS
TRANSFORMERS
SWITCHGEAR — HAND AND AUTOMATIC

**FOR ROTATING
ELECTRICAL MACHINES
TO
SPECIAL REQUIREMENTS**

GEORGE COHEN

SONS AND COMPANY LIMITED

WOOD LANE, LONDON, W.12.
Telephone: SHEpherds Bush 2070

STANNINGLEY, NR. LEEDS
Telephone: Pudsey 2241



And at Kingsbury (Nr. Tamworth), Manchester, Glasgow, Bath, Swansea, Newcastle-on-Tyne, Belfast, Sheffield, Southampton



LEY'S

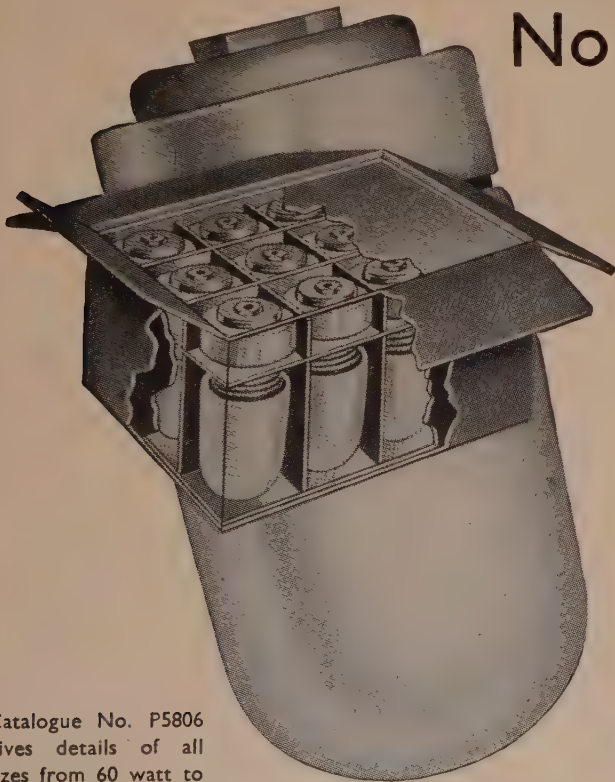
'Black Heart' Malleable

LEY'S MALLEABLE CASTINGS CO. LTD., DERBY
Telephone: DERBY 45671



**Strength
Ductility**

No **CASE** for complaint



Catalogue No. P5806
gives details of all
sizes from 60 watt to
500 watt.

With R.E.A.L. Watertight Fittings supplied by the dozen
in this rail-certified container, customers can be certain
that they'll arrive in perfect condition, with no lost
rubber rings or lampholders ... no straw-covered glass
to clean ... no breakages. Just a part of the
service - R.E.A.L. service!

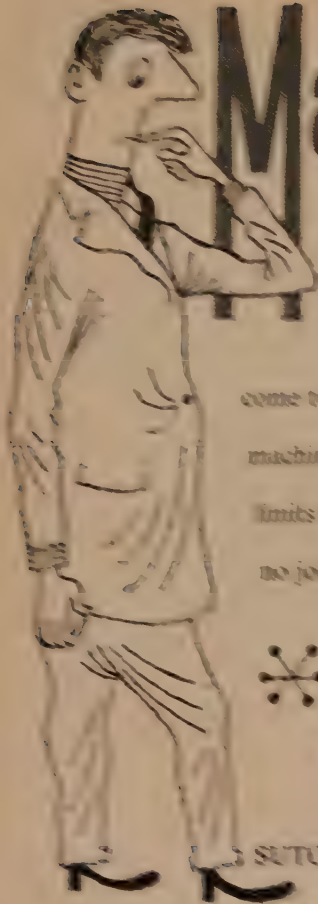
REAL

Watertight Fittings

Patent No. 568702

PERFECT PROTECTION IN THE PERFECT PACK

R.E.A.L. is the registered trade mark of
ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. Works, Birmingham, 18



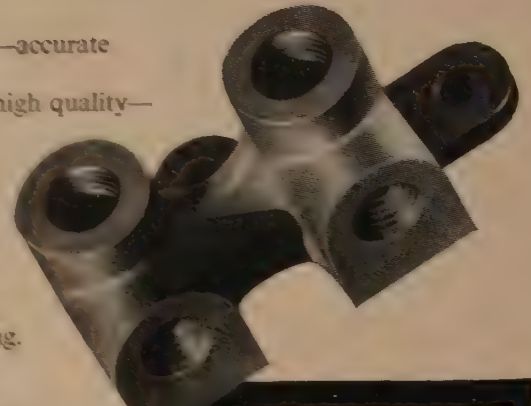
May we do your pressing? ✱

For hot pressings and stampings—accurate
well-finished and of consistently high quality—

come to Sutcliffe Speakman. We undertake
machining where necessary and can work to
limits down to .0005". No quantity is too large,
no job too complicated, no standard too exacting.



*In all non-ferrous alloys including aluminium, brass
aluminium copper, cadmium copper, manganese bronze and
nickel silver. Also castings in gun-metal, phosphor bronze
and heat-resisting nickel chrome alloys.*



**SUTCLIFFE
SPEAKMAN**

SUTCLIFFE SPEAKMAN AND CO. LIMITED · Leigh, Lancashire · Telephone: Leigh 94

LONDON OFFICE: 2 CANTON STREET WESTMINSTER S.W.1. TELEPHONE: ABBEY 3085

The APPELBE "BULB FIXER"

NO LADDERS REQUIRED

Telescopic appliance for fixing and removing
electric bulbs. Any reasonable height can
be reached.

Made of Aluminium and
can be carried with ease
on any cycle.

STANDARD MODEL

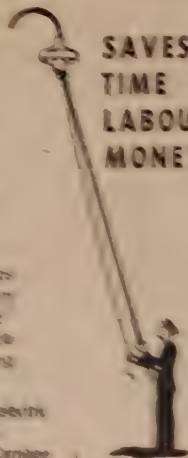
for 220 to 250 watt lamps
at 10' 6" from ground.
5' 0" closed, 12' 0" ex-
tended. Weight 2 lb. Cycle
clips and telescopic tubing
supplied.

"A" MODEL

for 220 to 500 watt lamps
15' 0" up at 20' 0" from
ground. 7' 0" closed, 16' 2"
extended. Weight 5 lb. Cycle
clips and telescopic tubing
supplied.

Used by the leading corporations and electric
light companies throughout the world.
Prices and particulars on request. Carriage
Post in Great Britain.

**SAVES
TIME
LABOUR
MONEY**



J. F. APPELBE & CO. LTD.
GREAT UNION STREET, HULL

Telephone: 55222, 51212 and 31225. Telegraphic Address: "Appelbe, Hull"

FOR ANYTHING IN MICA MICANITE BAKELITE

Moulding, Commutator, Flexible,
Heat-resisting Qualities, Commu-
tator Rings, Spools, Tubes, etc.

Mouldings of any shape or form,
Tubes, Plates, Washers, Sheets in
all thicknesses, etc.

Natural in all Grades and Quali-
ties. Stove Micas, Plates, Washers,
Commutator Segments, Condenser
Films, etc.

Send to the Manufacturers:

THE BIRMINGHAM MICA CO. LTD.

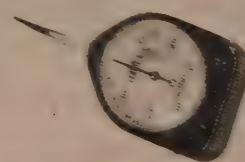
South Road + Hockley + Birmingham

Phone: Northern 563112

Telegrams: "Insulation, Phone, Birmingham"

RELAY USERS "CORREX" TENSION GAUGES

The only instrument solely designed for accurately measuring tension on
Relays, Contacts, Switchgear, and electrical apparatus of all kinds.



Gauge measures
in grammes, and
a large range
of sizes is pro-
duced to cover
from 0.3-2,000
grammes.

Swiss made and
guaranteed.

For illustrations and prices from the Sole Distributors throughout the U.K.

JAMES W. CARR & CO. LTD.

Dept. SALES, 7-15, Rosebery Avenue, LONDON, E.C.1

Telephone: TERMINUS 8846 (P.B.X.)



Quality on the Road in the 90's

(from The Mansell Collection)

CRYSELCO

lamps and fittings can be obtained from any of fourteen branches and depots throughout the country.

All CRYSELCO business is based upon a policy of Quality and Service.

This attention to detail in production and distribution, coupled with more than 60 years' experience in lamp manufacture, ensures quality products, promptly delivered.

The range of lamps and fittings available is extensive. If you have not received the current catalogue, please send for one today.

QUALITY and SERVICE

CRYSELCO BRANCHES

are situated throughout the country.

Their aim is to give you quality products plus good service.

CRYSELCO Managers in the following towns and cities would be pleased to hear from you.

BEDFORD
BIRMINGHAM
BRISTOL
BURY ST EDMUNDS
CARDIFF
GLASGOW
LEEDS
LEICESTER
LIVERPOOL
LONDON
MANCHESTER
NEWCASTLE
NOTTINGHAM
SOUTHAMPTON



CRYSELCO LIMITED
KEMPSTON WORKS BEDFORD



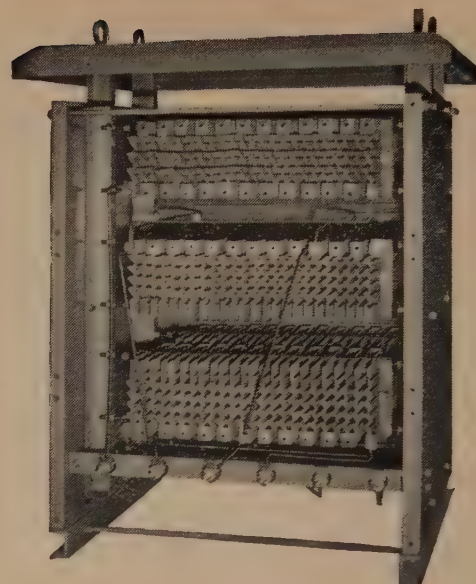
Service by Rail, Atlantic Coast Express

(Photo British Railways)

Let **Fawcett** carry the load . .

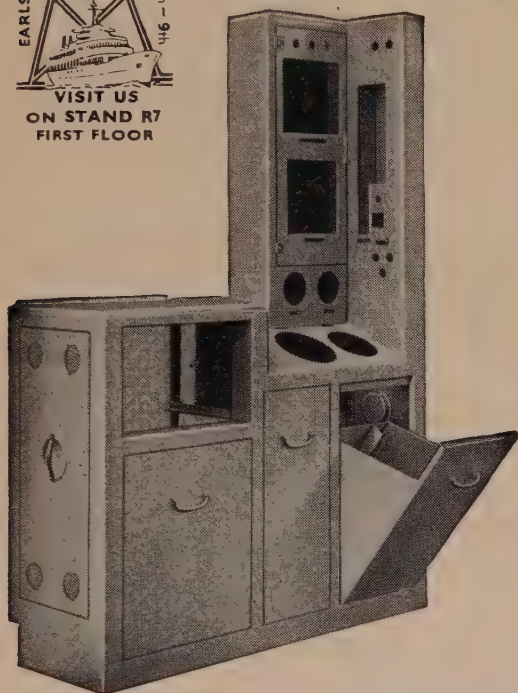
A.S.E.E.
ELECTRICAL
ENGINEERS
EXHIBITION

EARLS COURT
APRIL 5th - 9th
VISIT US
ON STAND R7
FIRST FLOOR



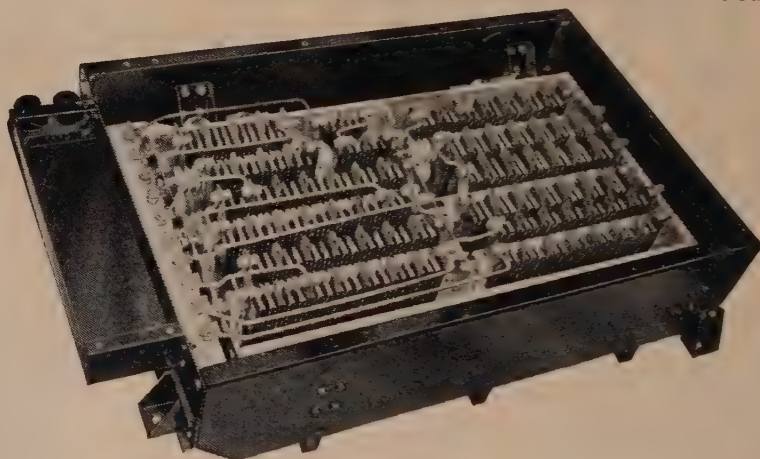
● F. P. SERVICE RESISTORS

Unbreakable. Rustless. Rigid. Weatherproof or open types built to any specific rating. Grids of top grade materials to suit ohmic values required. Spot welding of grids prevents non-homogeneous contact joints. Banks easily removed—no dismantling required. For Industrial, Traction, Power Station and Marine installation.



● CUBICLES AND PANELS FOR SWITCHGEAR AND INSTRUMENTS

Quality Switchgear and Instruments are best fitted in Fawcett Cubicles, Panels and Control Desks — manufactured to your own specification or expertly designed to your particular requirements. High quality materials and stove enamel finish with latest equipment.



● F. P. HIGH-TEMP. RESISTORS

Designed to operate at high temperatures. High overload capacity. No local hot spots. Safe operation. Minimum space and weight. Unbreakable. For Traction, Industrial and Marine installation.

Please quote Ref. No. 162/N in your enquiries

Fawcett

A Member of the Metal



Industries Group of Companies

FAWCETT PRESTON & COMPANY LIMITED (Incorporating FINNEY PRESSES)
BROMBOROUGH · CHESHIRE

Phone: Rock Ferry 2201. Grams: "Fawcett Bromborough"

Branch Offices in London, Birmingham & Newcastle-upon-Tyne

Export Office: Brook House, Park Lane, London, W.1

Telephone: Hyde Park 6770. Telegrams: "Metindlim London"

TAKE YOUR PICK

Our wide range of capacitors, incorporating all the very latest developments, are described fully in these new leaflets . . .

SEND NOW for COPIES

DALY has succeeded in maintaining full capacity values and working voltages in more compact designs, specially suited to ultra-modern equipment:

PHOTO-FLASH EQUIPMENT • DEAF AIDS
PRIVATE TELEPHONE INSTALLATIONS
AMPLIFIERS • D.C. POWER UNITS
TRANSISTOR EQUIPMENT
MAGNETISATION EQUIPMENT
TEST GEAR

DALY
ELECTROLYTIC CAPACITORS
Condenser Specialists for over 20 years.

DALY (Condensers) LTD., WEST LODGE WORKS,
THE GREEN, EALING, LONDON, W.5. PHONE: EALING 3127-8-9. CABLES: DALCYON, LONDON

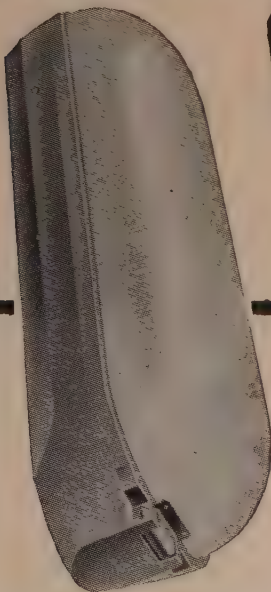
Introducing an entirely

NEW

MINIATURE FLUORESCENT LIGHTING FITTING

COMPLETE WITH TWO 12-inch, 8-watt LAMPS

Consider these new and unique design features



Wherever a 25/40/60 watt tungsten filament lamp is now used here is a vastly superior fitting for all such applications.

Lampholder (Patent applied for). Design of Fitting (Registration applied for).

1. Designed to comply with B.S.2467:1954.
2. Fully tested before and after fitting lamps.
3. Weatherproof and Dustproof.
4. Adequately protected against normal corrosion.
5. Perspex cover, for maximum light transmission and diffusion.
6. Uses modern low-loss chokes.
7. Fully power factor corrected.
8. Separate circuit for each lamp ensuring maximum availability.
9. Shrouded lampholders to accommodate lamps to American, European or British standards of tube diameter.
10. Lamp life 12 months or more when operated continuously.

Please see leaflet L 300 for complete details.

Victor

VICTOR PRODUCTS (WALLSEND) LTD. WALLSEND - ON - TYNE, ENGLAND.

Tel: Wallsend 68331 (6 lines) Cables: 'Victor' Wallsend, England.

London Office: 1327 London Road, Norbury, S.W.16

Telephone: Pollards 0077 (3 lines)

District Office Telephone Nos:

Newport 62094.

Stockport 5295.

Doncaster 2515.

Edinburgh 53987.

Chesterfield 6222.

Lichfield 2052.

From Wholesale Stockists throughout the British Isles.

MF/1

ENBRAY

MOTOR CONTROL GEAR

- AC and DC Contactor Starters
- Industrial or Marine Patterns
- Relays, Timers and Contactors
- Regulators. Hand or Motor operated
- Control Panels and Cubicles

- Robust Design
- Competitive Prices
- Prompt Deliveries

Makers of Quality Control Gear for nearly forty years

E. N. BRAY LTD

Head Office and Works:

BRITANNIA ROAD, WALTHAM CROSS, HERTS

Telephone: Waltham Cross 22212-5

Branches:

GLASGOW: 190 West George Street, Glasgow, C.2 Telephone: Douglas 1271

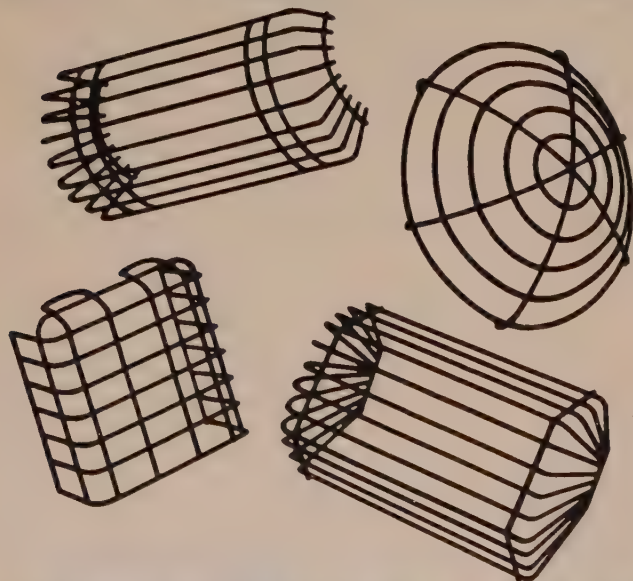
MANCHESTER: Canada Chambers, 36 Spring Gardens, Manchester 2.
Telephone: Blackfriars 4791

BIRMINGHAM: 19 Darnel Hurst Road, Little Sutton, Sutton Coldfield, Birmingham.
Telephone: Four Oaks 2185

London and South — apply Head Office

WIRE GUARDS

made to
BRITISH STANDARDS SPECIFICATION



H.W. CARTER & JAMES LTD

BALSALL HEATH WIRE WORKS
WENMAN STREET
BIRMINGHAM 12

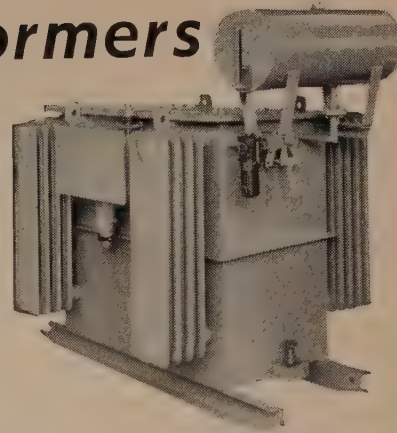
PHONE
CALTHORPE 1733

GRAMS
WIRING
SHEATH

Transformers by Sturdy

FROM 500 VA
TO 200 kVA

REGULARLY
SUPPLIED TO
NATIONAL COAL
BOARD, CENTRAL
ELECTRICITY GENERATING
BOARD, AND MANY OTHER LARGE
INDUSTRIAL UNDERTAKINGS



Typical 200 kVA
Transformer

ALSO

Power Transductors

FOR FINGER-TIP MANUAL OR
AUTOMATIC CONTROL OF POWER
UP TO 500 kVA

Sturdy ELECTRIC CO. LTD.
HAMSTERLEY COLLIERY
NEWCASTLE-UPON-TYNE

PHONE: EBCHESHER 271/2

TELEGRAMS: STURDITRAN, NEWCASTLE-UPON-TYNE

I'm Hi-Scale the Connector...



Until I bowed and made my entrance upon the scene of the British Electrical market only one type of connector was used here.

My hardened steel wire spring forms a thread on the electrical conductors and sits on the wires like a nut on a bolt—safe and sound—AND VIBRATION WILL NOT SHAKE ME LOOSE. If you will admit me to your tool box, Mr. Electrician, you will be ultimately convinced that I can serve you well and splice heavy wire combinations with safety too—you will save on your labour and ultimately even some junction boxes on certain installations.

Let your wholesaler introduce me. I will serve you well, I promise, as well as I have for many years the Canadian electrician, for those in the U.S.A. and on the continent. I represent an entire family of wire connectors made in a variety of sizes to serve your every need. I don't crush or destroy your wires, I hug them, bring them close together safely and securely. I splice them. This is what you want, isn't it? And I am much cheaper.

FOUR POPULAR SIZES ARE:

HS5. 2-3/029 to 2-18 swg. HS18. 2-7/036 to 2-16 swg.
HS7. 3-3/036 to 2-18 swg. HS21. 2-7/044 to 2-14 swg.

You are invited to write for FREE SAMPLES of this amazing new modern plastic wire connector to the Sole Distributors for U.K.

FitzGibbon & Murray, Ltd.

Smallfield Works, Horley, Surrey

Telephone: Horley 4598

TO DESIGNERS
PROTOTYPE & MAINTENANCE ENGINEERS

A 24 hr Service
for
**ELECTRONIC
COMPONENTS**

We produce a comprehensive range
of high-quality Electronic Components.
Consult our catalogue for your requirements.
Our "By Return" Service will ensure
immediate despatch of your orders.

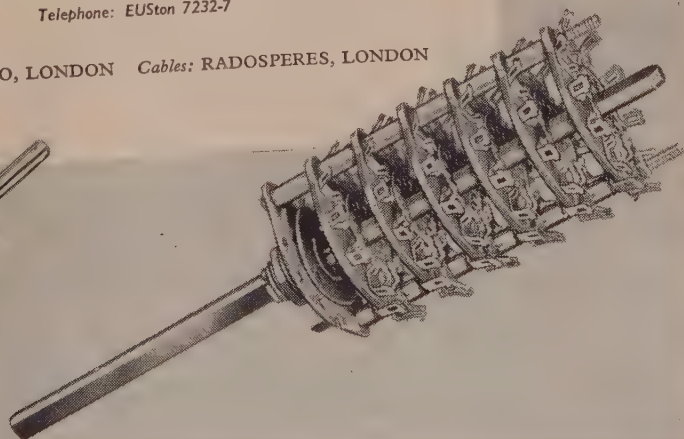
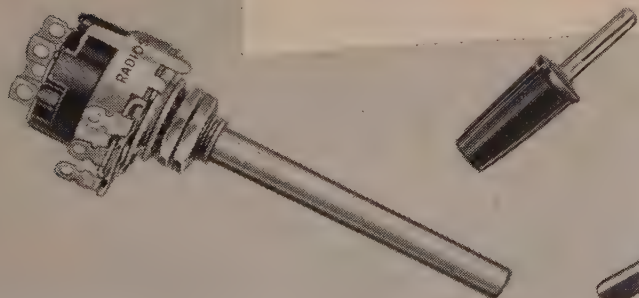
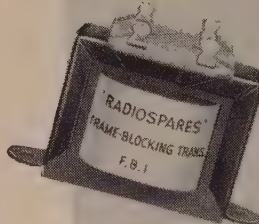
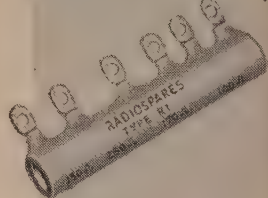
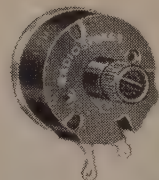
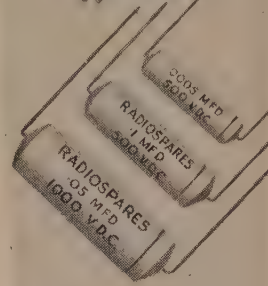
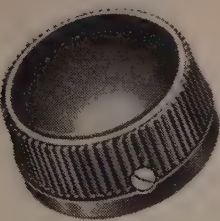
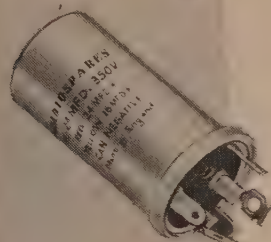
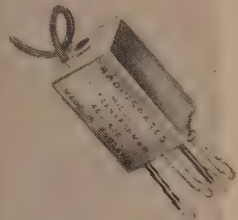
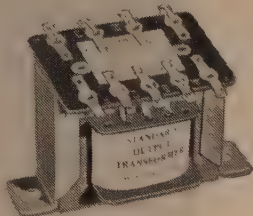
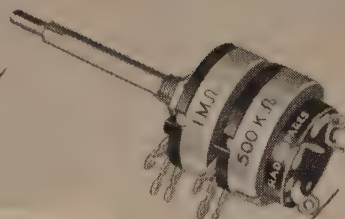
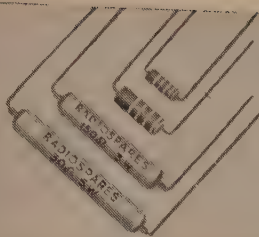


RadioSpares Ltd.

4-8 MAPLE STREET · LONDON · W.1 · ENGLAND

Telephone: EUston 7232-7

Telegrams: RADOSPERES, WESDO, LONDON Cables: RADOSPERES, LONDON



JEARY

for the best industrial electrical equipment

Specialists in Geared and Fractional H.P. Motors

Distributors of :

- Crabtree Motor Controllers • M.E.M. Switch and Control Gear
- Fans - Propeller and Axial Flow including Flame Proof up to 36"

M.K. Stockists

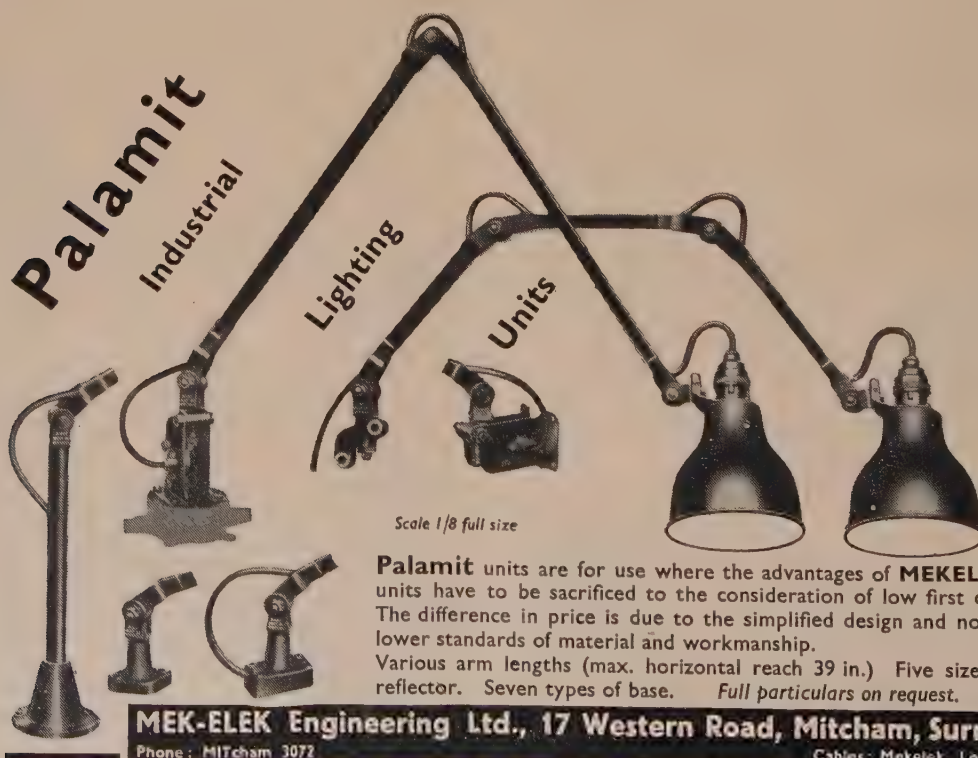
TIME SWITCHES

JEARY ELECTRICAL CO. LTD. Estab. 1887

Main Stores, 132/143 East Road, London, N.I.

Tel.: CLerkenwell 4141

WPS-36



Palamit
Industrial
Lighting
Units

Scale 1/8 full size

Palamit units are for use where the advantages of **MEKELITE** units have to be sacrificed to the consideration of low first cost. The difference in price is due to the simplified design and not to lower standards of material and workmanship. Various arm lengths (max. horizontal reach 39 in.) Five sizes of reflector. Seven types of base. *Full particulars on request.*

MEK-ELEK Engineering Ltd., 17 Western Road, Mitcham, Surrey
Phone: MITcham 3072
Cables: MEkelite, London

**23,000
ELECTRICAL
POINTS**

IN THESE TWO ESTATES

Electrical Contractors
Curtis's 1693, High Street,
Knowle, Warwickshire

Pheasey Estate
Great Barr, Birmingham

Architect and Builder
Henry Boot & Sons (Midlands) Ltd.
Great Barr, Birmingham.



**Wired throughout with "VOLEX" CABLES
LAMP HOLDERS · CEILING ROSES**

School Farm Estate
Sutton Coldfield

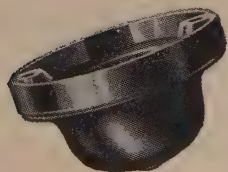
Architect and Builder
Compton Bros. Ltd.,
Enfield, Middlesex.



**S.C.C.G.
LAMP HOLDER**



**BATTEN
LAMP HOLDER**



**CEILING
ROSE**

Volex

Installations of this type demand a high standard of material. Volex Cables and Electrical Accessories were selected only after very careful consideration because they are known to give effective and trouble-free service.

Note to Electrical Contractors :

If you are tendering for competitive installations, our representative in your area would be pleased to give you details of our products.

VOLEX ELECTRICAL PRODUCTS LTD.

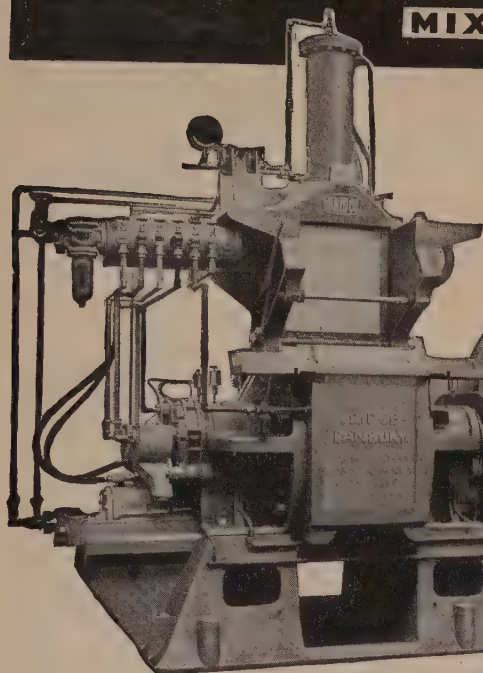
Telephone: PENDLETON 4373.

SALFORD 6.

Telegrams: VOLEXPROD Salford 6.

Bridge-Banbury

MIXERS



SIZE 11 BRIDGE-BANBURY

Produce the
Highest Output

more quickly, more efficiently,
and guarantee a more uniform
and

Highest Quality

mix. By minimising manual operating they
produce at

Lowest Costs with the maxi-
mum degree of dependability and safety.

Consult our engineering service on layouts and
machines for rubber and plastics. Our catalogue
BB200 is yours for the asking.

In technical association with Farrel-
Birmingham Co. Inc. U.S.A.

BRIDGE-BANBURY
Automation

DAVID BRIDGE & CO. LTD., CASTLETON, ROCHDALE, LANCs

Phone: CASTLETON (ROCHDALE) 57216

Grams: Coupling Phone Castleton Lancs

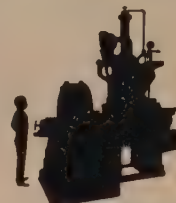
LONDON OFFICE: BROUGHTON HOUSE, 6-7-8 SACKVILLE STREET, PICCADILLY, W.1

Phone: REGENT 7480

Grams and Cables: "EDERACEO" Piccy London



SIZE 8 BRIDGE-BANBURY



SIZE 3A BRIDGE-BANBURY



SIZE 9 BRIDGE-BANBURY



SIZE 27 BRIDGE-BANBURY

QUICKWAY



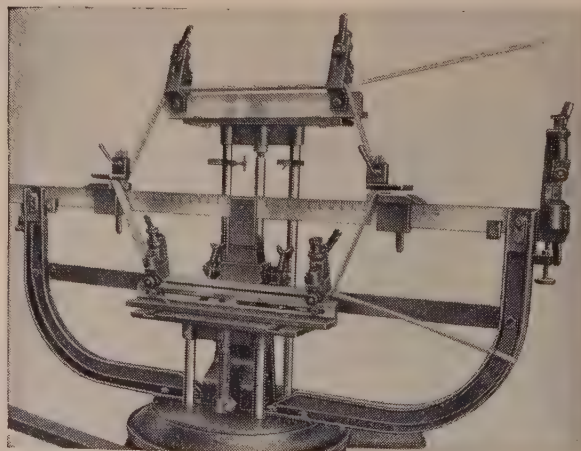
Coilwinding and forming machine

is used by leading manufacturers and repairers
of electrical equipment and produces a wide range
of uniformly shaped armature and stator coils.

The standard machine produces formed coils up to
28 in. loop length. Additional attachments can
increase the range up to 42 in. loop length.

Also available in the "QUICKWAY" range are
armature winding and taping machines.

Send for further details to the "QUICKWAY"
Department.



THE MIDLAND DYNAMO CO. LTD.

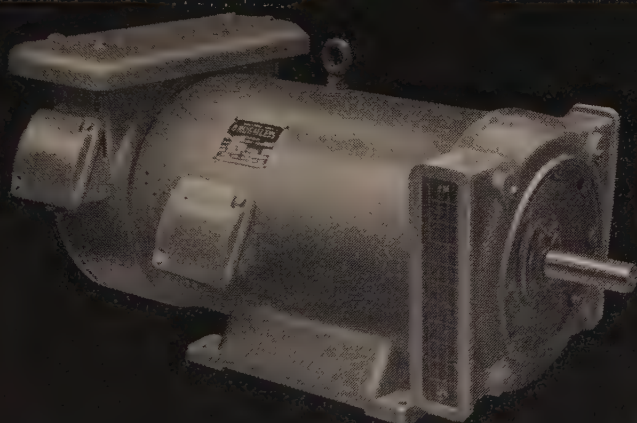
QUICKWAY WORKS - LEICESTER - Tel. 20172 (5 lines) Grams: "DYNAMO" LEICESTER

Increased
RELIABILITY

REDUCED
Maintenance

because

the source of
faults and breakdowns
is removed



Macfarlane
BRUSHLESS
Alternator

The Macfarlane Brushless Alternator has no frictional surfaces—neither brushes, commutators nor slip rings. It is completely free from carbon or copper dust, and the trouble these can cause is eliminated completely.

The only maintenance required is periodic cleaning of air vents, etc.

Available in a range of outputs from 10-150 kVA.

Voltage regulation $\pm 1\frac{1}{2}\%$ as standard.

Completely stable hot or cold.

THE MACFARLANE ENGINEERING CO LTD.

Netherlee Road. Cathcart, Glasgow, S.4

Telephone Merrylee 2255-7

WEATHERPROOF METAL-GLAD SOCKETS, PLUGS, SWITCH SOCKETS etc. for all electrical purposes

1160 TRADE MARK
NIPHAN

5-300 amp. 250-500 Volt

Diagram for
Temporary Lighting
with fittings
connecting to
6-way Tee



Cast Brass Terminal
Socket and Cover

Push-on Plug



C.I. Switch



Push-on Flange Socket
with Spring Cover



6-way Tee
and Cover

SIMMONDS & STOKES (NIPHAN) LTD

MANUFACTURING ELECTRICAL ENGINEERS

Victoria House, Southampton Row, London, W.C.1. HOLborn 2163, 8637

PORTABLE TRANSFORMERS



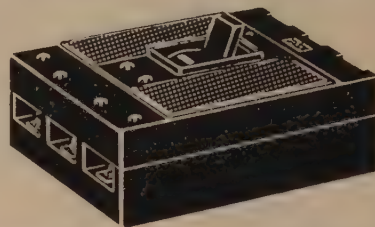
SIZES AVAILABLE:
60·120·250·500·750·1,000 VA
PRIMARY VOLTAGES:
200/250 VOLTS
SECONDARY VOLTAGES:
12·25·50·110 VOLTS

JOHN DRUMMOND (ENGINEERS) LTD

BELLCRAG WORKS, Dalsholm Road, GLASGOW N.W. Tel: MARYhill 3315/6

5 COMPACT w CIRCUIT BREAKERS

1. 63A—550V
2. 100A—600V
3. 200A—600V
4. 320A—600V
5. 400A—600V



"Compact" circuit breakers keep your circuits intact

5 REASONS FOR ADOPTION

1. RUGGEDNESS — LONG LIFE SERVICE
2. SAFETY TO PERSONNEL
3. SAFETY OF EQUIPMENT
4. EASE OF INSTALLATION
5. EASE OF OPERATION

Made by

**MERLIN
& GERIN**

Grenoble, France

All enquiries

TECHNIREP

2 Hill Street, St. Albans, Herts.

Telephone: St. Albans 51722

Profit on the side

The Grampian Hanging Diffuser Speaker is not normally mounted on its side but is hung from the ceiling, a beam, or a girder; and is used where a uniform Sound coverage is required.

The "Profit on the side" comes to you by suggesting to clients the advisability of installing a Sound System while you are carrying out normal electrical work. It is so much more costly for your client to have a Sound system installed separately, that the idea has only to be suggested at the right time and you have the opportunity of the extra profit involved, with little additional work.

Backed by the years of experience Grampian have had of high quality Sound installations you will have a first-class range of equipment and all the advice and assistance in planning we can give you.

Write to-day for leaflets on our range.

Grampian

Reproducers Limited

29 Hanworth Trading Estate,
Feltham, Middlesex
Telephone: Feltham 2657

*'Tis distance lends enchantment to the view,
And robes the mountain in its azure hue.*

(Pleasures of Hope by Thomas Campbell)



By courtesy of Tourist Information Centre, Belfast

Irish cables are manufactured amidst scenery depicted above, showing the famous and beautiful Mourne Mountains.

IRISH CABLES will stand inspection right through to the very core, as a result of the high quality of materials used and constant vigilance and inspection throughout manufacture

IRISH CABLES LIMITED

NEWCASTLE • CO. DOWN • NORTHERN IRELAND

Telephone : Newcastle (Co. Down) 2331/2

Belfast District Office :
No. 1 Advance Factory, DERRIAGHY
DUNMURRY • Northern Ireland
Telephone : Dunmurry 2535

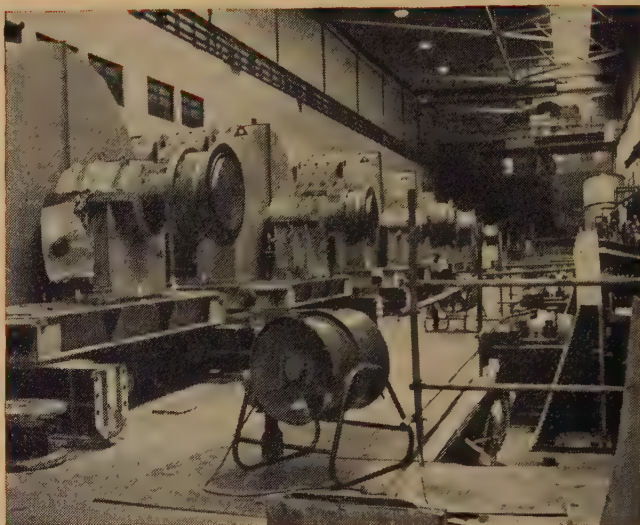
London Office :
19/21 FITZROY STREET
LONDON, W.1
Telephone : LAngham 8317/9



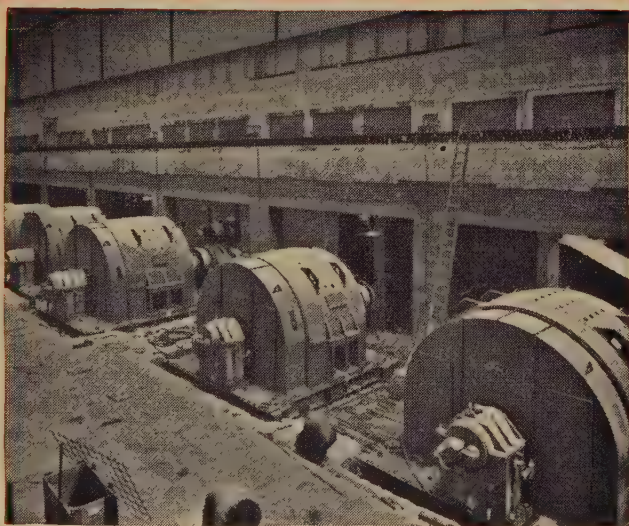
Target beaten in

At the Ebbw Vale Steelworks of Richard Thomas and Baldwins Limited re-motoring of the continuous hot strip mill was accomplished in only 19 days—one day ahead of schedule. This operation involved the removal of 1,500 tons of equipment and its replacement by new machinery.

The G.E.C., as the main contractors for the finishing mill electrical work, operated in close collaboration with Richard Thomas and Baldwins Limited and the Consulting Engineers, McLellan and Partners. The contract covered the supply and erection of the main drive motors, rectifiers, transformers, d.c. circuit breakers and all protective, control and instrumentation equipment for the finishing mill.



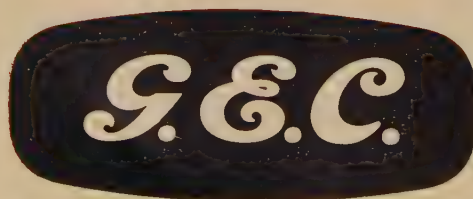
1. With the new, more powerful motors lined up behind the old, and with much of the associated equipment already installed, everything was set for the changeover.



4. The mill couplings were then fitted. The new total of 23,000 horsepower will give the finishing mill a substantially higher output than the former capacity of 16,000 tons per week.



5. From the new, wide-view pulpit, the operators control the rolling operations. The mill voltage is automatically set up and checked by means of indicator lamps which show when each operation in the sequence is complete.



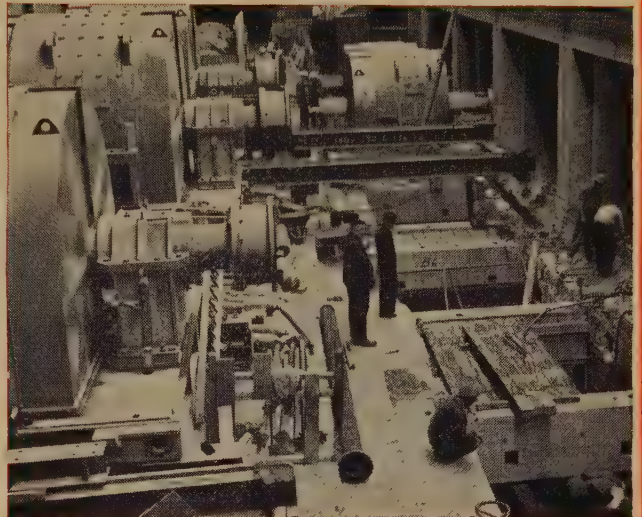
OF ENGLAND

mill re-motoring



2.

Work started at 9 a.m. on August 1st, within minutes of the last strip passing over the run-out table, and foundations were quickly prepared for the new machines.



3.

Work went on all round the clock. Winches were used to slide 480 tons of motors on heavy beams across the motor room and the machines were lowered on to the foundations.



6.

At 12.40 p.m. on August 20th the mill commenced rolling, so bringing the changeover to a successful conclusion in record time.



7.

More than 60 tons of busbars and cables link the motors, the control gear and 19,800 kW of grid-controlled rectifiers which provide power for the finishing train.

THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND
Plant Co-ordination Division, Birmingham, 6

THE SPECIAL TECHNIQUES OF H.D.A.



Precision Forging means exactly what it says—forging to such very fine tolerances that often no machining is required. Components such as the impeller shown here can be used in the ‘as forged’ condition.

This saves time; this saves money; this saves effort, H.D.A. can do it.

(Forging in Hiduminium 42 for Simms Motor & Electronics Corporation Ltd.)

Hiduminium
makes the most of Aluminium

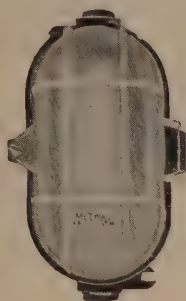
HIGH
DUTY
ALLOYS LTD. BLOUGH, BEDFORDSHIRE

'METWAY'

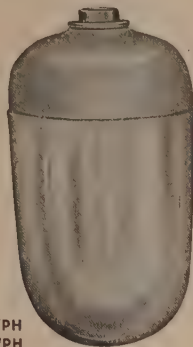
Announce

A NEW ERA!

BULKHEAD FITTINGS IN BAKELITE



917/PH
918/PH



WELL GLASS FITTINGS IN PORCELAIN



917/5647
918/5648

BULKHEAD FITTINGS

List No.	Size	Diffuser	Each
2682/PH	40 watts	Clear Plastic	10/6
2682/PHR	"	Red Plastic	11/6
2682/PHY	"	Yellow Plastic	11/6
2682/PHG	"	Green Plastic	11/6
2650/PH	60 watts	Clear Glass	9/8
2652/PH	"	"	Without Guard 13/8
2655/PH	100 watts	"	With Guard 13/8
2657/PH	"	"	Without Guard 17/8
	"	"	With Guard 17/8

All Subject to Trade and Wholesale Discounts

WELL GLASS FITTINGS (With Porcelain Tops)

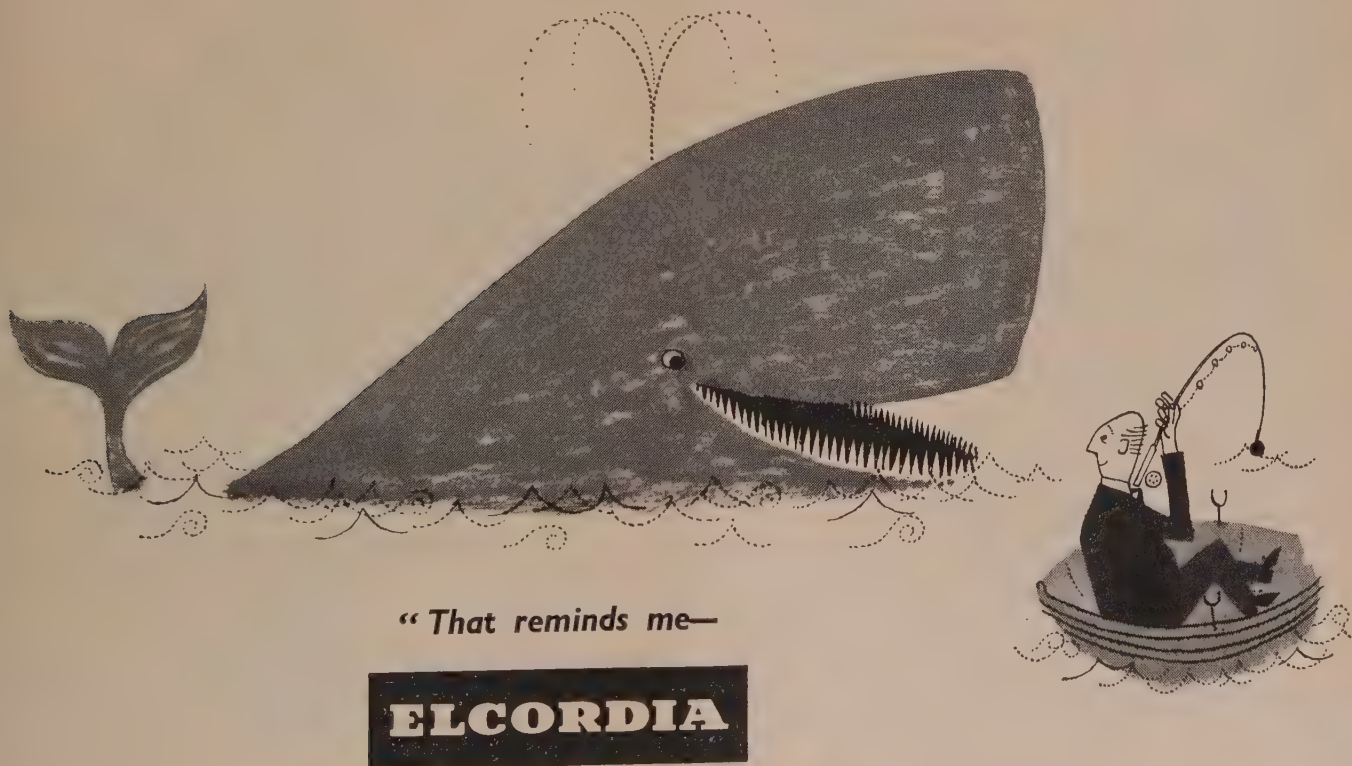
List No.	Size	Each
917/PH	40/60 watts	12/4
918/PH	75/100 watts	17/8
917/PH/SH	40/60 watts	13/4
918/PH/SH	75/100 watts	18/8
917/5647	40/60 watts	16/8
918/5648	75/100 watts	25/4
917/5647/SH	40/60 watts	19/4
918/5648/SH	75/100 watts	26/4

All Complete With Porcelain B.C. Lampholders

Ask for List No. 1859/ER

METWAY • KEMPTOWN • BRIGHTON • ENGLAND

Visit us on Stand N.12, A.S.E.E. Exhibition, Earls Court, 5th—9th April, 1960



"That reminds me—"

ELCORDIA

transformers can be made up to 1,000 kVA"

Both standard and special types are supplied for mining, industrial and a wide variety of domestic and other purposes.

ELCORDIA LIMITED, MELINGRIFFITH WORKS, WHITCHURCH, CARDIFF

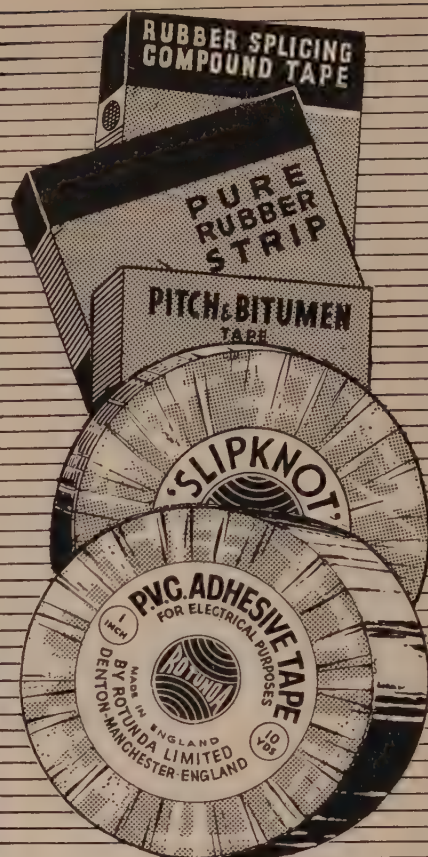
Telephone: Whitchurch 2071

**AVOID
SHORTS**



Take no chances-use

ROTUNDA
INSULATING TAPES



ROTUNDA LIMITED • DENTON • MANCHESTER

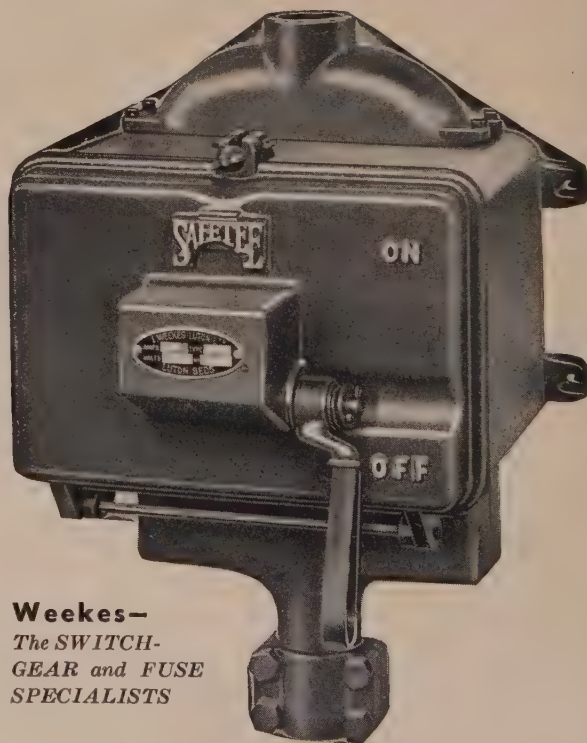
Weekes

**'SAFETEE'
combined switchfuse
with interlocked plug**

- ★ Standard rating up to 500 amps, 500 volts A.C. or D.C.
- ★ Totally enclosed, watertight or weatherproof to order.
- ★ Quick break.
- ★ Fully interlocked.
- ★ Cartridge Fuses.
- ★ Cable entries as required.

Full details on request from :

**L. WEEKES
(LUTON) LIMITED**

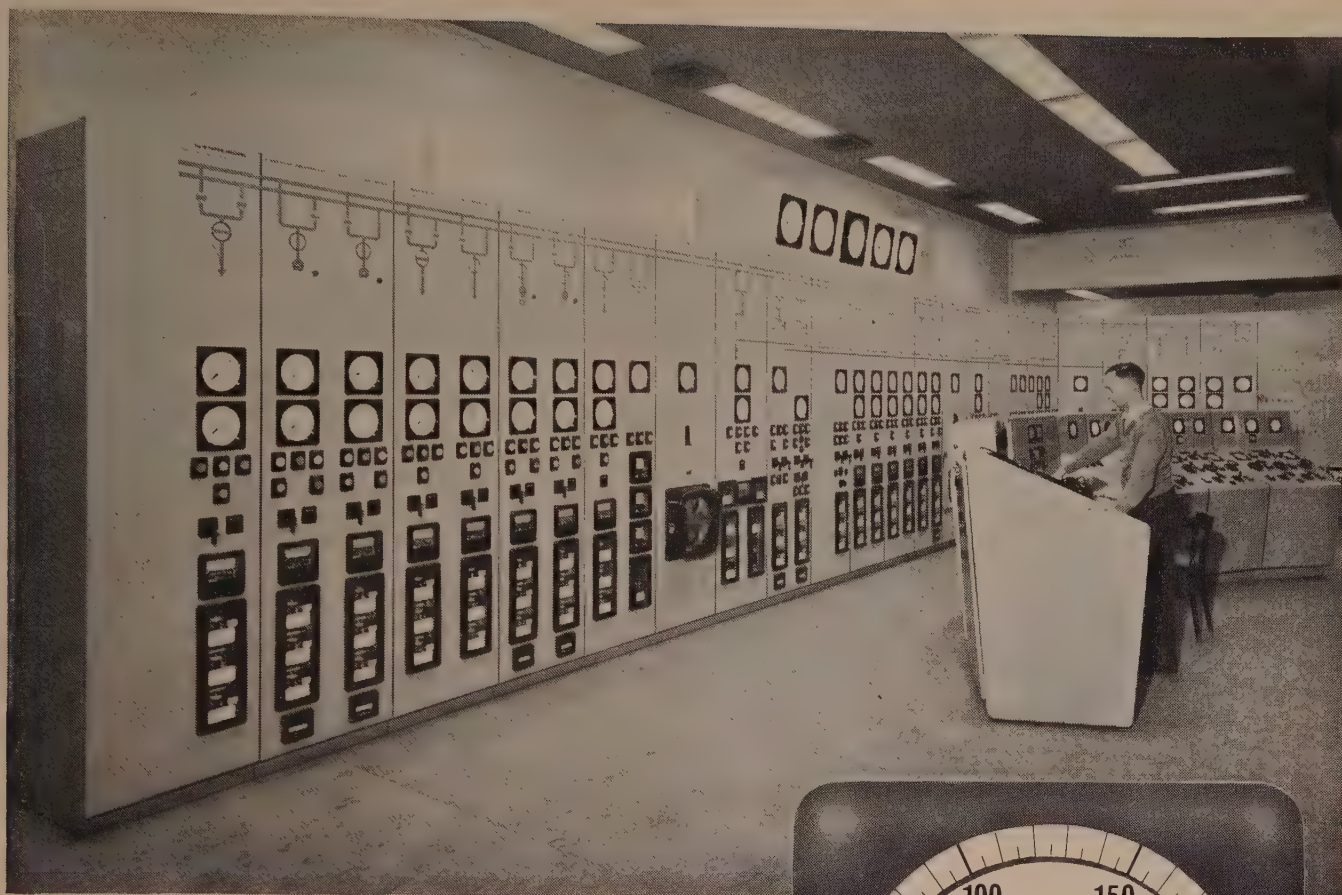


**Weekes—
The SWITCH-
GEAR and FUSE
SPECIALISTS**

WINGATE ROAD • LUTON • BEDS

Tel. LUTON 51478

Grams: "SAFETEE, LUTON"



By kind permission of the Bowater Organisation. Control room of the Power Station of the Mersey Division of the Bowater Organisation (control board by Switchgear & Cowans Ltd.)

RECORD



'CIRSCALE' AMMETERS, VOLTMETERS, WATTMETERS, TACHOMETERS, etc. RECORD GRAPHIC RECORDERS

We are proud to be associated with the new Mill extensions as suppliers of instruments not only for the Control Boards illustrated above, but for electrical equipment for Paper Machinery and Wood Grinder Plant.

THE RECORD ELECTRICAL CO. LTD.

"Cirscale Works", Broadheath, Altrincham, Cheshire

Offices at Belfast, Birmingham, Dublin, Glasgow, Leeds, London.

Telephones: Altrincham 3221 (5 lines) &
Telegrams and Cables: Cirscale, Altrincham.



SYNCHRONOUS MOTORS

(Swiss made)



for time switches' timers, signal installations, time lag relays, recorder chart feeds and similar apparatus. This motor has many advantages: solid construction, instant starting, slow running and thus minimum wear, faultless self-lubricating rotor bearings, highest possible torque, wide choice of speeds, dust and splash-proof, no maintenance required.

FRED FERRARIS (Clerkenwell) LTD.

Instrument Makers, Design, Prototype & Production

18a, NORTHAMPTON SQUARE, LONDON E.C.1

Telephone: Clerkenwell 2676/7

SAFETY FIRST



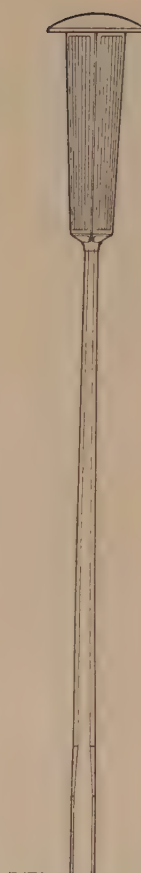
Special Heavy Industrial Lighting Brackets complete with Low Voltage Transformer to B.S.S.794
1, 2 or 3 Arm Brackets
Send us enquiries for your Low Voltage Equipment



MERITUS (BARNET) LTD.

BARNET, HERTS.

Bar. 2291/2



Lantern No. 709
(4-80 watt lamps)



VERTICAL

FLUORESCENT FITTINGS for STREET LIGHTING

- LANTERNS complete with CONTROL GEAR AND WIRED Ready for fitting on to NEW or EXISTING COLUMNS
- BASE OF LANTERN CAN BE MADE TO MATCH ANY SHAPE OF POLE SECTION and
- HAS PANELS FOR DOWNWARD LIGHTING
- BODY OF LANTERN MADE OF MOULDED CORRUGATED "PERSPEX" (DIAMOND 030) OPAL
- DOORS HINGED FOR EASY ACCESS Available for 24", 48" and 60" lamps

For further details apply to:

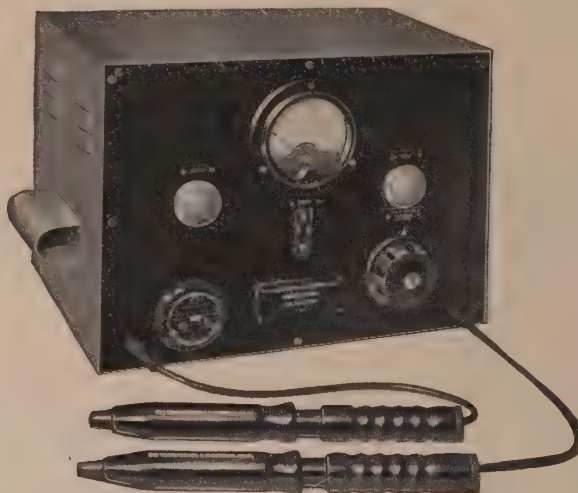
BLEECO LTD.

35 Wellington Road

Brighton 7. Phone: BRIGHTON 24661

Insist on T.E.C.

ELECTRONIC CONTROL EQUIPMENT, POWER AND DISTRIBUTION TRANSFORMERS TO 100 kVA, LOW VOLTAGE, FLASH TEST, RECTIFIER AND DENTAL PLATING UNITS, METAL WORK, TRANSFORMER REPAIRS AND CHOKES

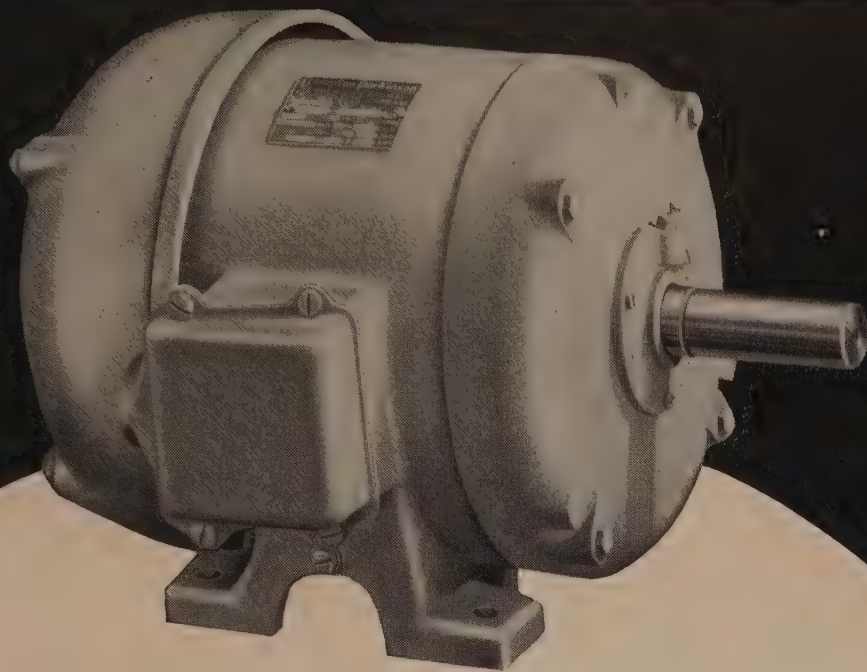


FLASH TEST UNIT

Leaflets on request:-

The
TRANSFORMER & ELECTRICAL CO. LTD.
HONYWOOD RD., BASILDON, ESSEX

Telephone: Basildon 20491/3



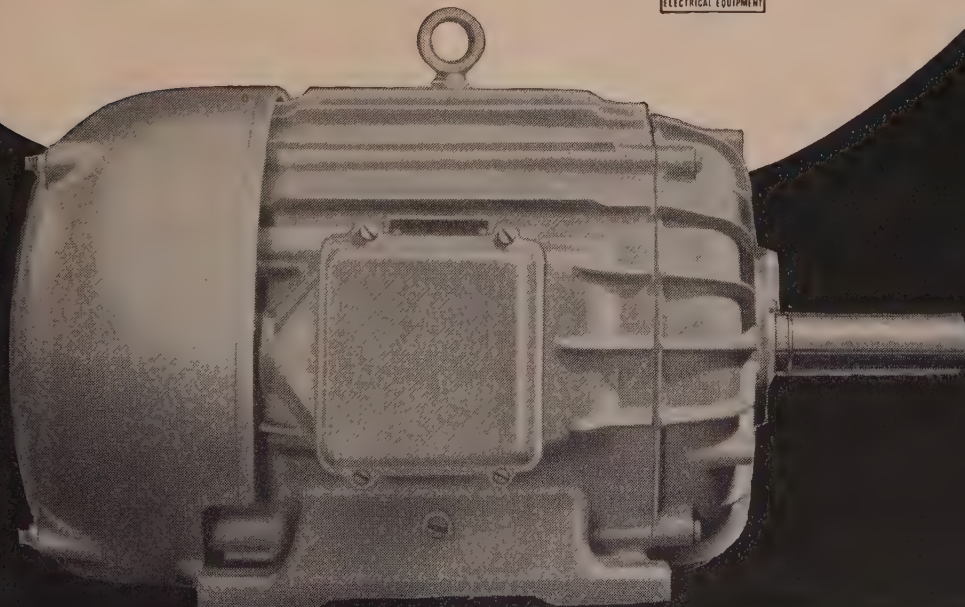
**A new range of totally-enclosed
fan-cooled motors ...
Smaller, lighter than previous
T.E.F.C. standards ...
Frame sizes identical with
ventilated motors of the same rating
... the T.E.F.C. range of Series 5
A.C. motors made by**

Electrically these motors conform to B.S. 2613:1957 Class E insulation. Dimensions conform to a new B.S. draft specification and are the same as Series 5 ventilated motors which can be found in B.S. 2960:1958. These motors can be supplied interchangeable with N.E.M.A. totally-enclosed, fan-cooled motors of the same rating.

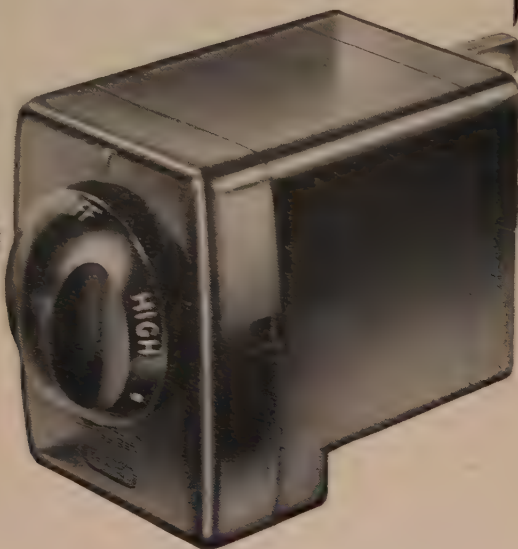
The first batch—ratings from 1 to 7½ h.p. at 1400 r.p.m. can be ordered now. The remainder of the range, 10 h.p. to 40 h.p. at 1400 r.p.m., will be available during the Spring.

Write for full technical information

Crompton Parkinson
LIMITED



this is
happening
everywhere!



Special offer!

Initial orders for 12 and more will be supplied in this attractive display carton

Yes, everywhere people are buying a "Reguplug"! Housewives, householders, handymen—they are all pleased with this good idea which Sunvic call the "Reguplug". When customers see the "Reguplug" displayed—they buy! For here at last is a handy little device for controlling heat output of numerous electrical appliances. The "Reguplug" enables people, quite simply, to regulate an appliance to give just the heat required. Saves switching on and off—saves electricity! Ideal for heated carpet underlay, airing and drying cabinets, percolators, kettles, electric blankets, soldering irons, glue pots, heating platens, urns, wash boilers, sterilising equipment, and any electrical heating appliance.

Retail Prices

REGUPLUG

15 amp round pin ... 35/-

REGUPLUG

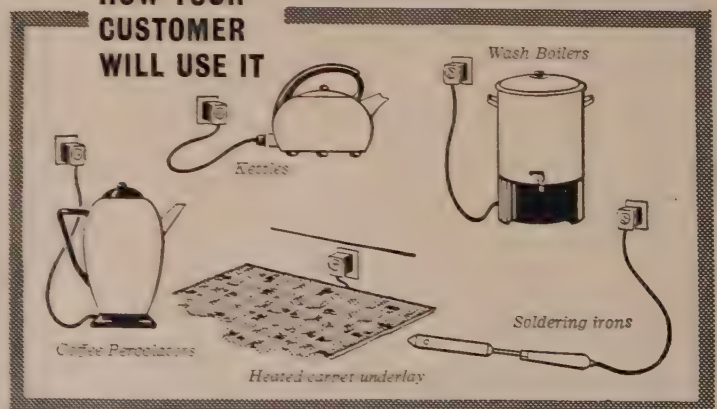
13 amp
flat pin (fused) ... 37 6

WHAT IS THE "REGUPLUG"?

The "Reguplug" is the "Simmerstat" designed to fit directly into a three-pin socket. It provides any piece of electrical heating apparatus with continuously variable control from off to full. Definite dwells are provided in the OFF and HIGH positions. Moulding is of high quality bakelite, white or brown. Silver contacts. For 13 amp and 15 amp circuits, 230 240V A.C., complying with BSS 1363 and BSS 546 respectively.



HOW YOUR CUSTOMER WILL USE IT



The Sunvic "Reguplug" is a product of:



Instrumentation Division

Associated Electrical Industries Limited

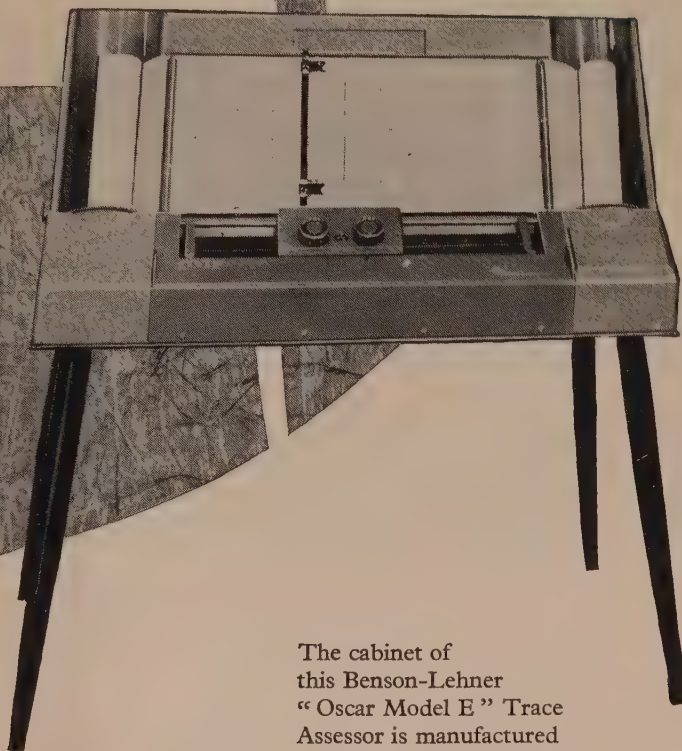
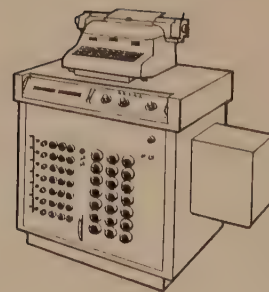
P.O. BOX NO. 1 HARLOW, ESSEX

Telephone: HARLOW 25271

Telegrams: "SUNVIC, HARLOW"

8C/93A

Trace Assessor Cabinet



Made from **TURNERS**

The cabinet of
this Benson-Lehner
"Oscar Model E" Trace
Assessor is manufactured
by Dormac Ltd., Lymington
from Turners "Duraglas"

*Photograph by courtesy of
Benson-Lehner (G.B.) Ltd.*

For information on
all products in the Duraglas
range, including glass yarn,
roving, cloth, woven roving,
tape and Duramat write for
publication D3.

DURAGLAS Regd.

GLASS FIBRE REINFORCEMENTS

"TURNERS" is the trade name of
TURNER BROTHERS ASBESTOS CO LTD ROCHDALE ENGLAND
A MEMBER OF THE TURNER & NEWALL ORGANISATION

FALKS

keep pace—

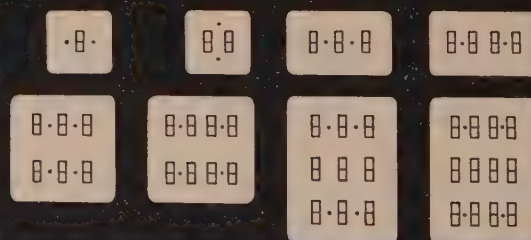
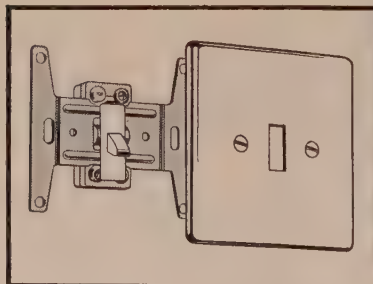
the ultimate for the moment

FALKS 'PLAINPLATE'

Modern design in multi-unit switching. Grid-clip system for speed in installation.

A smooth metal plate in Coinage Bronze, Florentine Bronze, Satin Chrome or Anodised Aluminium.

5 amp. 1 way. 5 amp. 2 way.
5 amp. intermediate.
5 amp. Double pole 1 way.
13 amp. 1 way. 13 amp. 2 way.
Bell push unit.
Pilot-light unit.
Shown above with secret fixing screws.



Full details from:

FALK STADELMANN & CO. LTD.

91 Farringdon Road, London, E.C.1. Telephone: HOL 7654

Showrooms: 20/22 Mount Street, London, W.1. MAY 5671

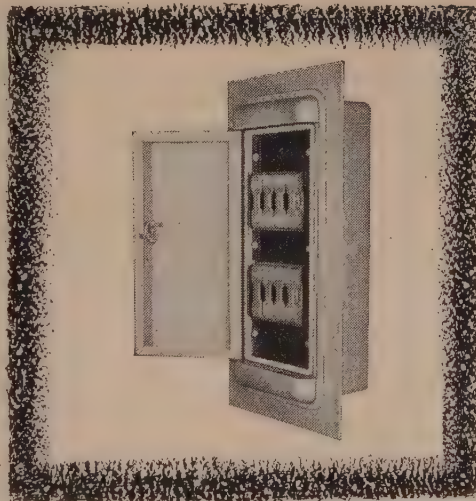
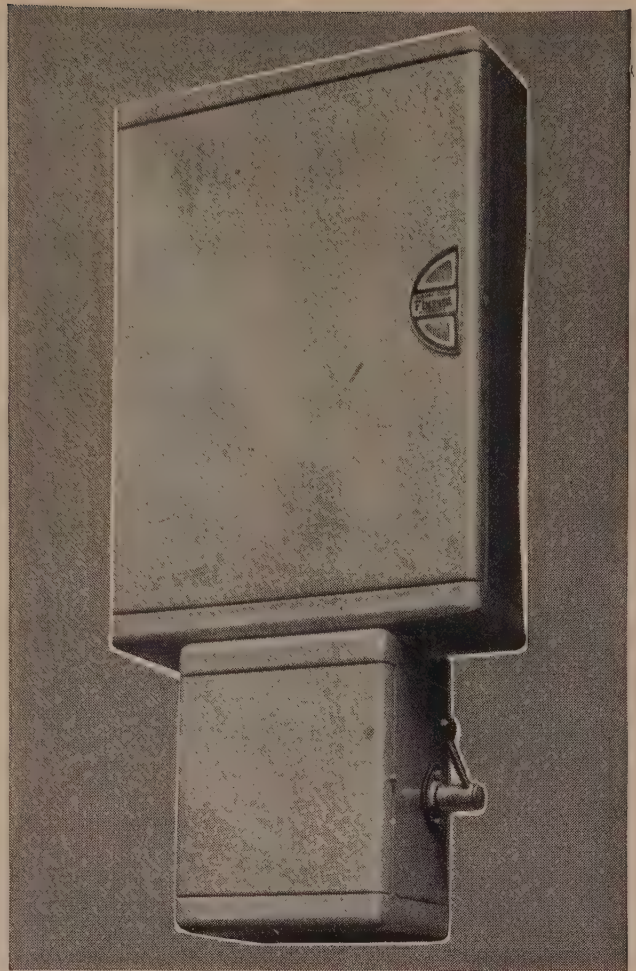
Branches at: — Glasgow: Central 9494 (4 lines). Edinburgh: CAL 2364. Manchester: Deansgate 3351. Liverpool: Central 7683/4/5. Birmingham: Central 8031/2/3. Newcastle-under-Lyme: Tel. No. 69573. Dublin: Tel. No. 77694/5. Cardiff: Tel. No. 30351. Swansea: Tel. No. 55442. Newcastle-on-Tyne: 22483/4/5. Leeds: Tel. No. 29741/2. Bradford: Tel. No. 21905. Nottingham: Tel. No. 51448/9. Brighton: Tel. No. 64077/8. Southampton: Tel. No. 21336. Bristol: Tel. No. 27117/8. Belfast: Tel. No. 31269. (P3)



CABINET STYLE DISTRIBUTION BOARDS

Widespread acceptance of surface mounting Fluvent Cabinet Style Boards has resulted in the production of Switches of similar exterior, intended principally for use as control switches mounted in conjunction with the boards. Both boards and switches have pressed steel cabinets which are cadmium plated and painted to give a grey metallic hammer finish.

The range has been further reinforced by the production of boards for recessed mounting, illustrated right. They are designed to allow the main body of the board to be sunk into a wall cavity of appropriate depth; the plasterwork and wall finish are then made up to the surrounding surface plate provided.



ENERGY LIMITING FUSES

Fluvent Cabinet Style Distribution Boards are fitted with Aeroflex Energy Limiting High Breaking Capacity Rewireable Cartridge Fuses to BS.88-1952 Cat. 440 AC5 Class P. Standard fully wired cartridge fuse links are included unless otherwise specified, when appropriate underwirings can be fitted.



Parmiter Hope & Sugden Limited, MANCHESTER, 12.
 London: 34 VICTORIA STREET, S.W.1.
 Birmingham: 39/41 CARRS LANE, 4.
 Glasgow: 5 SOMERSET PLACE, C.3.

3Q

PRODUCTION 

G.E.C. original processes
now achieve
QUALITY QUANTITY QUICKLY

3Q production—Quality, Quantity—Quickly! That's the ideal production combination for semiconductors we've now achieved with G.E.C.-originated manufacturing processes. And it's because these new processes have so revolutionised our production that you can be sure of getting the G.E.C. devices you want—when you want them! We offer you the widest range in the country—at really competitive prices too!



G.E.C. has been first with
all these achievements!

Microwave detectors and mixers

Point contact diodes

Cold-welded copper-to-copper sealing

Copper sealing glass

85°C. junction temperature for germanium

12 amp. power transistor

Watch for future
advertisements describing
these and other new G.E.C.
developments



QUALITY · QUANTITY · QUICKLY

G.E.C.

SEMICONDUCTORS

For information on the range of G.E.C. semiconductor devices please write to: G.E.C. Semiconductor Division,
School Street, Hazel Grove, Stockport, Cheshire, or in London area, phone: TEMple Bar 8000, Extension 10.

Classified Advertisements

CLASSIFIED advertisements are **PREPAID** at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to **ELECTRICAL REVIEW PUBLICATIONS LTD.**

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o **ELECTRICAL REVIEW**, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, **ELECTRICAL REVIEW**. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

ELECTRICITY CORPORATION OF NIGERIA

Invitation to Tender:
150-MVA Ring Main Units

THE ELECTRICITY CORPORATION OF NIGERIA invites tenders for the supply c.i.f. to Apapa of 36 extensible pattern Ring Main Units having a minimum fault rating of 150 MVA at 6,600 volts.

Tender documents giving further details of the contract may be obtained from:—

The Resident Engineer,
Electricity Corporation of Nigeria,
Nigeria House,
9, Northumberland Avenue,
London, W.C.2.

Each tender must be enclosed in a sealed envelope marked "Confidential: Tender for Supply of 150-MVA R.M.U.s." and must be received at the Office of

The Secretary,
Electricity Corporation of Nigeria,
Electricity Headquarters,
13, Broad Street,
Private Mail Bag 2030,
Lagos, Nigeria,
West Africa,

not later than noon on Wednesday, 10th February, 1960, and should be valid until at least 31st March, 1960. Tenders received in any other manner will not be considered.

The Electricity Corporation of Nigeria does not undertake to accept the lowest or any tender.

Further information concerning this contract may be obtained on application to the Resident Engineer.

C. K. O. ADENAIKE,
Acting Secretary to the Corporation.

2919

SADDLEWORTH URBAN DISTRICT COUNCIL

Street Lighting

TENDERS are invited for the installation of Street Lighting at the Brownhill Housing Estate, Austerlands.

The scheme is comprised of 10 lighting points mounted on concrete columns.

Specification, bills of quantities and form of tender may be obtained on application to Mr. G. H. Booth, Lighting Superintendent, Council Offices, Uppermill, Nr. Oldham.

Tenders in plain sealed envelopes, which must not bear any name or mark indicating the sender, endorsed "Tender for Street Lighting," addressed to the Clerk of the Council, Council Offices, Uppermill, Nr. Oldham, must be delivered on or before 12 noon on 4th February, 1960.

The Council do not bind themselves to accept the lowest or any tender.

T. NUTTALL,
Clerk of the Council.

2914

CITY AND COUNTY OF NEWCASTLE UPON TYNE

New Town Hall

THE City Council invites Specialist Contractors possessing substantial organisation who are willing to submit a firm price tender for

- (a) ELECTRICAL INSTALLATION
- (b) ELECTRIC LIFT INSTALLATION

in the New Town Hall, and who wish to be considered for inclusion in a selected list of tenderers, to apply in writing in the first instance to the City Architect, 18, Cloth Market, Newcastle upon Tyne, 1, for particulars of the scope and magnitude of the work to be carried out.

Initial applications for more detailed information as to the work should reach the City Architect not later than the 23rd January, 1960.

JOHN ATKINSON,

Town Hall, Newcastle upon Tyne, 1.
30th December, 1959. 2820

BOROUGH OF BATLEY

Street Lighting Department

TENDERS are invited for the supply of the following equipment for Class A lighting:

- Sodium Lanterns, 140 watts.
- Control Gear for above.
- 140-watt Sodium Lamps and Jackets.
- 25-ft. Concrete Columns with bracket arms.
- Solar Dial Time Switches.
- 3/029 Twin and Earth Cable.

Specification and form of tender may be obtained from the Borough Surveyor, Hanover Street, Batley, and tenders, in a plain sealed envelope (not bearing any name or mark indicating the sender), endorsed "Tender for Street Lighting Equipment," must be delivered to the undersigned not later than the 30th January, 1960.

The Corporation does not bind itself to accept the lowest or any tender.

L. O. BOTTOMLEY,
Town Clerk. 2941

BOROUGH OF DAGENHAM

Street Lighting:
London/Tilbury Trunk Road, A.13

TENDERS are invited for the supply of 24 Lanterns, Chokes, Lamps and 18 Capacitors for a 400-watt Mercury installation. Specification and form of tender may be obtained from the Borough Engineer and Surveyor.

Tenders, in the official envelopes provided, must be delivered to the undersigned by Friday, 29th January, 1960.

KEITH LAUDER,
Civic Centre, Dagenham. 2939

DURHAM COUNTY COUNCIL

TENDERS invited:—

Billingham New Day School:
Electrical Installation.

Houghton-le-Spring Modern School:
Electrical Installation.

Application for further details to County Architect, South Street, Durham, not later than 27th January, 1960.

J. K. HOPE,
Shire Hall, Durham. 2942

Advertisements are accepted up to first post on Monday of the week of issue

If displayed with boxed rules, name or symbol block by Friday prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

HAMPSHIRE COUNTY COUNCIL

Basingstoke Technical College: Phase I

TENDERS are invited from suitable suppliers for the provision of equipment detailed on the following schedules for the above new college. Suppliers interested may obtain the appropriate schedules direct from the Principal, Basingstoke Technical College, and completed tenders are to be returned to the Clerk of the County Council, The Castle, Winchester, by 10th February, 1960.

Schedule II: Apparatus, Metrology.

- I: Furniture, Drawing Offices.
- III: Apparatus, Physics Laboratories.
- IV: Chemistry
- V: Biology Laboratory.
- VI: Heat Engines
- VII: Testing Machines.
- VIII: Electrical Machines and Equipment.
- IX: Welding Workshops.
- X: Woodworking Machinery.
- XI: Hand Tools, Engineering.
- XII: Building.
- XIII: Teaching Aids, etc.

2931

BOROUGH OF WIDNES

THE Corporation invites tenders for the supply of the undermentioned materials required in the Highways Department during the twelve months ending 31st March, 1961:—

- 1. Electrical Equipment.
- 2. Electric Lamps.
- 3. Gas Fittings and Mantles.

Forms of tender, specification and envelopes, in which the tenders must be submitted, may be obtained from F. A. J. Knight, Esq., A.M.I.C.E., M.I.Mun.E., Borough Engineer and Surveyor, Town Hall, Widnes.

Tenders, in envelopes provided, to be forwarded to reach the undersigned not later than 9 a.m. on Thursday, 11th February, 1960.

The Council do not bind themselves to accept the lowest or any tender.

FRANK HOWARTH,
Town Hall, Widnes. 2930
January, 1960.

BOROUGH OF HORNSEY

Annual Supply of Sodium Discharge Lamps

TENDERS are invited for supply of the above for the period ending 31st March, 1961. Documents on application to Borough Engineer, Town Hall, London, N.8.

Last date for receipt of tenders, Monday, 8th February, 1960.

W. B. MURGATROYD,
Town Clerk. 2944

FIFE COUNTY COUNCIL

Street Lighting Equipment

TENDERS are invited for the supply of 32 Steel Columns, Sodium Lanterns, etc., for Group "A" Roundabout Lighting.

Tender documents, obtainable from County Surveyor, Belfield, Cupar, must be returned marked "Roundabout Lighting, Glenrothes," by noon on 30th January, 1960, to the County Clerk, Cupar, Fife. 2902

Official Notices (continued)

COUNTY BOROUGH OF
GREAT YARMOUTH

Annual Contracts

THE Council invite tenders for the supply of Electric Cables for a period of one year from 1st April, 1960. Specifications, forms of tender and conditions of contracts may be obtained from the Borough Engineer, Town Hall, Great Yarmouth.

Tenders, on the forms supplied, in a plain sealed envelope endorsed "Tender for Electric Cables," must reach me not later than Friday, 29th January, 1960.

No guarantee is given that the lowest or any tender will be accepted.

FARRA CONWAY,

Town Hall, Town Clerk.
Great Yarmouth.
12th January, 1960. 2943

FRIERN BARNET
URBAN DISTRICT COUNCIL

Annual Tenders

TENDERS are invited for the supply and delivery of Street Lighting Lamps for twelve months commencing 1st April, 1960.

Specification and form of tender, etc., may be obtained from the Engineer and Surveyor, Town Hall, London, N.11.

Tenders are to be delivered to the undersigned not later than 10 a.m. on Wednesday, 3rd February, 1960.

R. S. CLOTHIER,

Town Hall, Clerk of the Council.
London, N.11.
7th January, 1960. 2929

AMESBURY PARISH COUNCIL

TENDERS are invited for the supply and erection of 63 140-watt Sodium Lamps on Trunk Road A.303 in Amesbury.

Specifications, etc., may be obtained from the Clerk of the Council, 52, Countess Road, Amesbury, by whom tenders must be received by 27th January, 1960.

The Council does not bind itself to accept the lowest or any tender. 2940

SITUATIONS VACANT

(See "Replies to Box Numbers" on page 115)

CENTRAL ELECTRICITY
GENERATING BOARD

Midlands Division

SHIFT CHARGE ENGINEER is required at Hams Hall "B" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.7, £1,195-£1,270 per annum.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear in a large modern power station are required; also a knowledge of P.F. firing. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 2/60MD, on form AE6, available from Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 25th January, 1960. 2906

JOSEPH LUCAS (ELECTRICAL) LTD.

ELECTRICAL ENGINEER

of H.N.C. standard required to be responsible for a subsection of development laboratory dealing with the life testing of automobile electrical equipment. Duties also include the analysis of test results and the resultant design change recommendations. Applicants should have previous experience in the development of light electrical equipment. The post is pensionable and a good starting salary will be paid. Five-day week.

Apply in writing, stating age, qualifications and experience to the Personnel Manager, JOSEPH LUCAS (ELECTRICAL) LIMITED, Great King St., Birmingham, 19, quoting reference PM/D/365. 2882



A vacancy has arisen in the

TRANSFORMER DEPARTMENT

for a

DESIGN ENGINEER

for work on control problems in relation to transformers and associated apparatus, including on-load tap change gear and high-voltage equipment.

Candidates should be under 30 years of age and possess a Higher National Certificate in Electrical Engineering.

The company has a pension scheme and a dependants' insurance scheme.

Application forms can be obtained from T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote ref. TD.

2890

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. Stations. The work of Station Engineer (G.D.) consists of installation, operation and maintenance of high and medium voltage electrical distribution systems, electrical power and lighting installations, control systems and generating plant; knowledge of heating and ventilating plant and diesel engines an advantage. Station Engineers (Mech.) are concerned with diesel power plant, steam and hot water heating systems, refrigeration and air conditioning and miscellaneous workshop plant, tools and equipment.

Commencing salary according to age, qualifications and experience. Salary ranges £680 to £850.

Candidates must hold O.N.C. Elect. or Mech., City and Guilds Electrical Technician's Certificate, 2nd Class M.O.T. Certificate or equivalent, and must also have had recognised apprenticeship with firm of good repute plus 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference to candidates with supervisory experience.

Opportunities for promotion up to Technical Grade A, maximum salary £1,565 (national rate) and pension prospects. Five-day week; three weeks three days leave a year initially. Internal training courses are provided and attendance at technical colleges by suitable candidates is sponsored. Overseas tours for which special allowances are payable in addition to higher salary.

Applications normally from natural-born British subjects only, up to age 55 years.

Write stating age, qualifications and experience to Manager (P.E.1), Professional and Executive Register, Ministry of Labour, Atlantic House, Farrington Street, London, E.C.4. No original testimonials should be sent. Only applicants selected for interview will be advised. 262

BRITISH STANDARDS INSTITUTION

Technical Staff

THE B.S.I. invites applications from ELECTRICAL ENGINEERS to join the technical staff of the Institution. This staff is responsible for the work of the Institution in the preparation of British Standards in co-operation with the various sections of industry and is required to plan and progress the work. They act as secretaries to technical committees.

Applicants should have a university degree or equivalent professional qualification in electrical engineering.

There are three grades of appointment, with an overall salary range up to £2,000 plus; applications are invited for the basic grade, the starting salary being dependent on individual qualifications and experience. The posts are pensionable.

Apply to the Establishments Officer, B.S.I., 2, Park Street, London, W.1. 2907

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Area Board Headquarters
Chief Engineer's Department

ASSISTANT SYSTEM CONTROL ENGINEER (shift duties) with location at the Board's Sub-Control Centre, Aykleyheads, Durham City. The successful applicant will be given suitable training and will be required to assist in the centralised control and operation of high voltage interconnected distribution networks operating at voltages up to 66kV. Applicants should preferably possess H.N.C. in Electrical Engineering or equivalent qualification and be conversant with operation and maintenance of H.V. distribution equipment. Knowledge of district work or protective gear operation an advantage. Starting salary according to qualifications and experience and within the range of Schedule B, Grade 6, £1,017 10s. to £1,254, inclusive of 10% shift allowance. N.J.B. conditions of service.

Wear Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER, Sunderland District. Applicants must be suitably qualified electrical engineers with sound practical training and experience in construction, operation and maintenance of overhead and underground networks and associated plant and equipment. Salary Schedule A, Class F, Grade 4, £1,095/£1,170. N.J.B. conditions of service.

Applications stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carlisle House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 2959

SOUTH EASTERN GAS BOARD

Isle of Grain Works Electrical Engineer

APPLICATIONS are invited for the appointment of ELECTRICAL ENGINEER at the Isle of Grain Works of the Board.

The electrical installation will comprise a power house having a capacity of 9,500 kW, operating in parallel with the public supply system, with associated high and low-voltage distribution systems, A.C. and D.C. motors and control gear.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, and must have extensive practical experience in the operation, control and maintenance of back-pressure turbine and oil engine-driven alternators, high and low-voltage switchgear, power cabling, mercury arc rectifiers, A.C. and D.C. motors, control gear and automatic control systems.

Salary within range £1,235-£1,533 per annum according to qualifications and experience.

Applications in writing, quoting reference V20/1155, and giving full details, to the Personnel Manager, South Eastern Gas Board, Katharine Street, Croydon, Surrey, within seven days. 2903

SOUTH EASTERN ELECTRICITY BOARD

SENIOR DEMONSTRATOR,
Folkestone and Ashford District.

Salary £640 × £20 to £700 per annum, under N.J.C. Grade 2. Superannuable. Applicants should have diploma or certificate in Domestic Science, also E.A.W. Certificate. Duties include lecturing, demonstrating, advising consumers, training junior demonstrators and generally assisting in any of the district's showrooms. Applications quoting E.R., and naming 2 referees, to District Manager, SEEBOARD, York House, Cheriton Gardens, Folkestone, by 27th January, 1960.

ASSISTANT DISTRICT ENGINEER,
Folkestone and Ashford District.

Salary £910-£955 per annum, N.J.B. Class F, Grade 7. Superannuable. Applicants who should possess H.N.C. or equivalent, should have had responsible experience and practice in the planning, construction, operation and maintenance of underground and overhead distribution networks in both urban and rural areas. Applications quoting E.R., and naming 2 referees, to District Manager, SEEBOARD, York House, Cheriton Gardens, Folkestone, by 27th January, 1960.

CARTOGRAPHIC DRAUGHTSMAN,
Croydon and Purley District.

Salary £525 × £20 to £625 per annum, plus London allowance, under N.J.C. Grade 1. Applicants must have sound experience in the preparation of mains records, network diagrams, site surveys and general drawing office duties. Applications quoting E.R., and naming 2 referees, on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 27th January, 1960.

ENGINEERING DRAUGHTSMAN,
Croydon and Purley District.

Salary £660 × £20 to £780 per annum, including London allowance, under N.J.B. Schedule D, Grade 6. Superannuable. Applicants should be of good general and technical education and should have experience in the layout of switchgear and associated equipment for substations up to 11 kV. Applications quoting E.R., and naming 2 referees, on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 27th January, 1960.

SENIOR DRAUGHTSMAN,

Croydon and Purley District.

Salary £830-£940 per annum, including London allowance, under N.J.B. Schedule D, Grade 5. Superannuable. Applicants should be suitably qualified and capable of supervising a large district drawing office under the District Engineer. Experience in basic design, layout of substations up to 11 kV, presentation of data and mains and system records is essential. Applications, quoting E.R., and naming 2 referees, on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 27th January, 1960.

ASSISTANT DISTRICT ENGINEER,
Dorking and Epsom District.

Salary £910-£955 per annum, N.J.B. Grade 7, Class F. Superannuable. Applicants, preferably Corporate Members of the I.E.E., should have had responsible experience and practice in the planning, construction and operation and maintenance of underground and overhead distribution networks in both urban and rural areas. Payment of a car allowance will be considered. Applications quoting E.R., and naming 2 referees, on forms from District Manager, SEEBOARD, 56, South Street, Dorking, by 27th January, 1960.

GEORGE WRAY,
Secretary.

2958

CENTRAL ELECTRICITY
GENERATING BOARD

South Wales Division
Vacancy No. 1/ER/60

APPLICATIONS invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER at UPPER BOAT POWER STATION.

Salary H.10, £860-£905 per annum.

Applicants should possess H.N.C. or equivalent qualification.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 21st January, 1960.

2923

THE ELECTRIC CONSTRUCTION
COMPANY LIMITED

Applications invited for the
position of

TOP LEVEL
SALES DEVELOPMENT ENGINEER

for

SOUTHERN ENGLAND

Applicants should be electrical engineers, preferably Corporate Members of the I.E.E., with wide experience in the sale of electrical plant.

The company manufactures rotating machines, switchgear, rectifiers and transformers, and experience in the sale of all these products would be an advantage.

A knowledge of the London area and suitable connections with the engineering industry would be further advantages.

Applications in writing, giving details of training, sales connections, etc., to:—

J. Johnson Smith, M.I.E.E.
Director

THE ELECTRIC CONSTRUCTION
COMPANY LIMITED

Bushbury House, 57, Buckingham Gate
Westminster, London, S.W.1

2919

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

NEW SUB-AREA SYSTEM CONTROL
CENTRE, CHALTON, NR. LUTON

(a) THIRD ASSISTANT ENGINEERS

(System Control) (5/60.N).

(b) FOURTH ASSISTANT ENGINEERS

(System Control) (6/60.N).

Candidates should have had a sound technical training together with experience of switching operations and maintenance work on H.V. distribution equipment. A knowledge of protective systems is desirable.

Salary N.J.B. Class L (a) Grade 10 (£1,025-£1,085); (b) Grade 13 (£860-£905), plus 10% shift allowance with minimum of £90.

Apply by letter to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, by 29th January, 1960.

BEDFORD DISTRICT

FOURTH ASSISTANT ENGINEER

(7/60.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems including substations.

Salary N.J.B. Class F, Grade 11 (£710-£755).

Apply by letter to the Manager, Bedford District, Eastern Electricity Board, Prebend Street, Bedford, by 29th January, 1960.

Northmet Sub-Area

SUB-AREA HEADQUARTERS
SOUTHGATE, LONDON, N.14

ENGINEERING DRAUGHTSMEN

(Ref. 831) (8/60.R).

Candidates should have had a good technical training and experience in the preparation of plans and detailed drawings of building and civil engineering works including substations, service centres, workshops, offices, etc.

Salary N.J.B. Schedule D, Grade 6 (£620-£740), plus London allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 25th January, 1960.

Suffolk Sub-Area

CLACTON DISTRICT
DEMONSTRATOR (4/60.R).

Candidates should have had domestic science training including electrical housecraft; should

preferably hold the E.A.W. Certificate and be competent to plan and give cookery demonstrations, including lectures, and advice to consumers on the use of domestic electrical appliances.

Salary N.J.C. Grade 1 (£525-£625), although progress beyond £565 will be subject to a certificate that the person is capable of undertaking all the duties of the grade.

Apply by letter to S. N. Boyne, A.M.I.E.E., Manager, Clacton District, Eastern Electricity Board, 56/58, Station Road, Clacton-on-Sea, Essex, by 26th February, 1960.

Fens Sub-Area

MILTON HALL, MILTON

NR. CAMBRIDGE

SUB-AREA COMMERCIAL OFFICER
(10/60.R).

The duties of the appointment will be assisting the Sub-Area Manager in dealing with commercial matters affecting the application of tariffs to all classes of consumers and the overall commercial development of this mainly rural Sub-Area.

Great importance is attached to ensuring a high and uniform standard of consumer service and to the sale of appliances and the expansion of installation contracting departments. The successful candidate would, therefore, be expected to participate in a very active manner in co-ordinating and developing these aspects of commercial work throughout the Sub-Area.

Salary in accordance with Grade 5, Class B (£1,740-£1,940) of the National Joint Managerial and Higher Executive Grades Agreement.

Apply by letter to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Nr. Cambridge, by 29th January, 1960.

2947

NEW ZEALAND MINISTRY OF WORKS
ENGINEERING STAFF

THE NEW ZEALAND MINISTRY OF WORKS invites applications for the following vacancies on the permanent staff. Positions, qualifications desired and salaries offered are as follows:—

Vacancy No. 3:

MECHANICAL OR
ELECTRICAL ENGINEERS.

Corporate Membership of the Institutions of Mechanical or Electrical Engineers, London, together with sufficient appropriate experience. Commencing salaries up to £1,525 p.a.

Vacancy No. 4:

BUILDING SERVICES
ENGINEERS.

Corporate Membership of the Institution of Heating and Ventilating Engineers, London. Commencing salaries up to £1,450 p.a.

Vacancy No. 5:

ASSISTANT MECHANICAL
OR ELECTRICAL ENGINEERS.

A University Degree in Mechanical Engineering or Graduate Membership of the Institutions of Mechanical or Electrical Engineers, London, together with at least five years' experience since commencement of pupillage. Commencing salaries £870 up to £1,060 p.a.

Vacancy No. 6:

ASSISTANT BUILDING
SERVICES ENGINEERS.

Graduate Membership of the Institution of Heating and Ventilating Engineers, London, with at least five years' experience since commencement of pupillage. Commencing salaries £870 to £1,060 p.a.

Experience is necessary in the design and installation of services or equipment for one or more of the following: heating and ventilating, air conditioning, hot and cold water or sewerage services, laundries, kitchens, boiler-houses, lifts and other mechanical services in offices, schools, hospitals, hotels, telephone exchanges, printing works, defence establishments, etc. All appointees will be required to undertake work of this nature.

Applicants must be resident in the United Kingdom or Eire and have fulfilled National Service obligations.

Enquiries, mentioning this publication and stating the vacancy number and the position sought, should be addressed to the High Commissioner for New Zealand, 415, Strand, London, W.C.2. Full details of duties, experience required, general information on the conditions of employment in the New Zealand Public Service and application forms will then be supplied.

2794

Situations Vacant (continued)

ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS required in following localities:—

LONDON AREA: MECHANICAL ENGINEER with sound knowledge of basic principles of thermo and fluid dynamics to carry out research programme in particular field of applied hydrodynamics. Experience in modern methods of design and research on axial flow compressors, turbines or pumps an advantage. MECHANICAL ENGINEER for research on precision gear design. MECHANICAL ENGINEER for work on propulsion problems. APPLIED MATHEMATICIAN for research of basic nature on stability of underwater vehicles; knowledge of theoretical hydrodynamics and theory of control mechanisms an advantage. APPLIED MATHEMATICIAN or THEORETICAL PHYSICIST for acoustic analysis. APPLIED MATHEMATICIAN for work with electronic computers, with special reference to research into general underwater physical problems. ELECTRONIC PHYSICISTS for data handling and analysis problems. EXPERIMENTAL PHYSICIST for research in underwater acoustics. PHYSICIST interested in operation performance. CLASSICAL PHYSICISTS.

BALDOCK: PHYSICISTS or APPLIED MATHEMATICIANS for research in Metal or Quantum Physics.

PORTSMOUTH: PHYSICISTS with experience in field of microwave techniques. ELECTRONIC/ELECTRO-MECHANICAL ENGINEERS (experience in servo-mechanisms an advantage).

HASLEMERE: ELECTRONIC ENGINEER.

PORTLAND: PHYSICISTS or APPLIED MATHEMATICIANS for research in underwater acoustics. PHYSICISTS (general). ELECTRICAL ENGINEERS with advanced electronic design experience. MECHANICAL ENGINEERS. PHYSICAL CHEMISTS.

POOLE: CHEMICAL ENGINEERS. CHEMISTS with experience in rubber technology.

ROSYTH: MECHANICAL ENGINEER with experience in welding development. ELECTRONIC PHYSICISTS.

Candidates must normally be natural-born British subjects of natural-born British parents, with First or Second Class Hons. Degrees or equivalent qualifications. S.S.O.s must have had three years' postgraduate experience and be not less than 26 years of age.

Salaries (men): S.S.O. £1,233-£1,460; S.O. £655-£1,150 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those under 32 to compete for established posts.

Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1 (quote A.483/9A). 259

PHILIPS ELECTRICAL LTD.

have a vacancy in London and the Home Counties for a man aged 25/35 as a

LIGHTING ENGINEER

The work demands a good illuminating engineering training (Dip. M.I.E.S. preferred but not essential), with a thorough knowledge of lamps and lighting equipment and circuits. Ability to deal with customers at all levels and discuss lighting problems is essential.

The post is pensionable, conditions of employment are progressive, and a car is provided.

Please write with all details to the

Employment Officer
Century House

Shaftesbury Avenue, London, W.C.2
quoting ref. 323

2921

J. STONE & Co. (DEPTFORD) LTD.

ARKLOW ROAD, LONDON, S.E.14

THIS old-established Engineering Company of international repute is engaged on an expanding volume of work on new products and is therefore seeking suitable men to fill the following posts:—

ENGINEER:

For work involving steam technology. Preferably of B.Sc.Eng. standard. H.N.C. standard acceptable if supported by relevant experience.

DESIGN & DEVELOPMENT (Senior & Junior) DRAUGHTSMEN:

For mechanical and electrical work. Should have served an apprenticeship and have minimum standard of O.N.C.

LABORATORY TECHNICIANS:

For research and development work. Should have H.N.C. and have electrical/mechanical experience.

Salaries for the above posts will be commensurate with age and experience. The work is interesting and offers good prospects to the right men.

Applications giving full details of age, education and experience to the Personnel Manager.

2945

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Birmingham and District Sub-Area

FOURTH ASSISTANT ENGINEER (Transmission Section, Headquarters). Experience necessary in the installation, operation and maintenance of switchgear, transformers, cables and protective equipment on circuits up to and including 33 kV. Technical qualifications desirable.

Salary £910/£1,025 per annum (N.J.B. Grades M.13/12) according to qualifications and experience.

Apply by letter, within 14 days, stating age, experience, qualifications, present salary and position to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire Sub-Area

DEMONSTRATOR (Female) (Stroud). Applicants must have had a good education and should have a certificate of a recognised domestic training college and/or the E.A.W. Certificate. Some selling experience would be an advantage. Duties include lecture demonstrations in service centres and elsewhere, and on consumers' premises, and advice to consumers on the selection and use of electrical apparatus. Applicants must be prepared to take an active part in the sales organisation.

Salary £525/£625 per annum (N.J.C. Grade 1).

Apply by letter, within 14 days, stating age, education, qualifications, training and experience to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

Shropshire and Herefordshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Wellington). Duties include the construction, maintenance and operation of H.V. and L.V. mains and substations, and applicants should have had experience in the planning of system reinforcements and mains extensions. Technical qualifications desirable.

Salary £815/£860 per annum (N.J.B. Grade F.9).

Apply by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

F. W. CATER,
Secretary. 2925

CHIEF ELECTRICIAN

required for large chemical works in N.W. England. No corrosive chemicals involved. Experienced in maintenance of all classes of switchgear from 11 kV downwards and motors from 1,000 h.p. to fractional. H.N.C. or equivalent.

Pension scheme. Staff house available within year.

Write stating age, experience and salary required to—Box 2909.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Liverpool North District of the Board's No. 1 Sub-Area:—

(a) FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER.

Salary within range £1,270/£1,360 per annum (N.J.B. J/5).

The candidate appointed will be responsible to the District Commercial Engineer for the organisation, control and operation of the Contracting and Installation Inspection Sections, assistance in negotiations with consumers in connection with additional supplies, load development, etc.

Applicants should have wide experience on the commercial side of the electricity supply industry, and should possess appropriate technical qualifications.

(b) CONSUMERS' ENGINEER.

Salary within range £1,025/£1,085 per annum (N.J.B. J/8).

The duties include responsibility to the First Assistant District Commercial Engineer for the control and operation of the service section dealing with estimating and specifications for contracting work, advising consumers on electricity supply matters, etc.

Applicants should possess appropriate technical qualifications.

(c) ASSISTANT CONSUMERS' ENGINEER (1).

Salary within range £860/£905 per annum (N.J.B. J/11).

Duties include estimating and preparation of specifications for contracting work, advising consumers on matters relating to electricity supply and utilisation of electrical equipment.

Applicants must have completed an electrical apprenticeship, and possession of technical qualifications is desirable.

(d) ASSISTANT CONSUMERS' ENGINEER (2).

Salary within range £710/£755 per annum (N.J.B. J/14).

The post offers an opportunity to a young man who has completed an electrical apprenticeship and made progress in his technical studies.

Appointments subject to medical examination. Pension scheme.

Apply to the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, for special application forms, indicating the vacancy in which you are interested. Closing date for return of applications, 30th January, 1960. 2953

ELECTRICIANS

ELECTRICIANS required for general maintenance and installation work on large integrated iron and steel works. Excellent conditions. Pension scheme in operation.

Apply to the Employment Officer, Appleby-Frodingham Steel Company, Scunthorpe, Lincs. 2864

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area
WAKEFIELD DISTRICT,
DISTRICT SENIOR CLERK.

The successful applicant will be responsible for all clerical work in the district including stores, collection of accounts, meter reading and commercial records.

Possession of a recognised qualification will be an advantage.

Salary N.J.C. Grade 7, £1,070/£30/£1,160 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 29th January, 1960.

No. 4 (Leeds) Sub-Area
LEEDS DISTRICT, FOURTH
ASSISTANT DISTRICT ENGINEER.

Applicants should have gained the H.N.C. in Electrical Engineering or equivalent qualifications and have experience in M.V. and H.V. construction, operation and maintenance and design of overhead and underground distribution systems and substations.

The successful candidate will be expected to reside in the district and undertake standby duties.

Salary N.J.B. Class K, Grade 11, £910/£15/£955 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, nr. Leeds, not later than 29th January, 1960.

No. 6 (Hull) Sub-Area
SENIOR DRAUGHTSMAN (Electrical).

Applicants must have experience in the layout of supply networks and of primary and other substations and in the preparation of drawings and diagrams of system layouts and electrical equipment. A knowledge of building construction and civil engineering work will be an advantage.

Salary N.J.B. Schedule D, Grade 5, £790/£20/£890 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 29th January, 1960. 2951

NORTH OF SCOTLAND
HYDRO-ELECTRIC BOARD

Senior Commercial Assistant (Agreements)

APPLICATIONS are invited for the above post at the Area Office, Dingwall.

Candidates should be qualified to advise prospective consumers on tariffs and conditions of supply and to negotiate agreements.

Salary £720-£960 (N.J.C. Grade 3-5) with placing according to qualifications and experience. Superannuation Scheme.

Applications stating age, qualifications and experience to be forwarded to the Area Manager, Church Street, Dingwall, by 30th January, 1960. 2960

DIELECTRICS

AN enthusiastic young electrical engineer or physicist required to undertake interesting experimental work on dielectrics and to be responsible for laboratory engaged upon control testing of same.

REPLIES FROM UNIVERSITY GRADUATES IN THEIR EARLIER TWENTIES WILL RECEIVE PARTICULARLY FAVOURABLE CONSIDERATION.

Situated in South-East England, the position is permanent, pensionable and carries a

Four-figure Starting Salary.

Write, stating age, qualifications and experience, to—Box 2827.

PHILIPS ELECTRICAL INDUSTRIES
LIMITED

have vacancies for

ELECTRICAL
DRAUGHTSMEN

in their

CENTRAL PLANT DEPARTMENT
at CROYDON, SURREY

The work involves the design and layout of power and lighting installations for large factories and office blocks. Candidates should have electrical drawing office experience, and preferably have reached O.N.C. (Elect.) standard.

Commencing salaries will be according to age and experience, and the company's conditions of employment include progressive pension, life assurance, holiday and sick pay schemes.

Applications, in writing, should be addressed to:—

The Personnel Officer (4/ER)
PHILIPS ELECTRICAL INDUSTRIES
LIMITED

Waddon House, Stafford Road
Croydon, Surrey

2920

CENTRAL ELECTRICITY
GENERATING BOARD

North Eastern and Yorkshire Region

Third Assistant Engineer

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER (Electrical) in the Yorkshire Division, Transmission Department, based on Leeds.

The successful applicant will be required to assist in the engineering and site supervision of contracts for the manufacture, supply and erection of plant and equipment at Grid substations. He should have a sound technical and practical training with experience of the construction of high-voltage substations, and preferably of operation and maintenance additionally.

Preference will be given to those candidates who are Chartered Electrical Engineers or hold equivalent qualifications.

Salary will be in accordance with the National Joint Board Agreement, Class AX/EX, Grade 5 (£1,090-£1,355 per annum), or Grade 6 (£925-£1,170 per annum), and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 25th January, 1960. 2916

DRAUGHTSMAN GRADE IV/III
(ELECTRICAL)

required by EAST AFRICAN RAILWAYS AND HARBOURS on probation for two years with prospects of permanent and pensionable employment. Commencing salary according to age and experience in scale (including inducement pay) £863 rising to £1,134 a year. Outfit allowance £30. Free passages. Liberal leave on full salary after each tour of 36-45 months.

Candidates, preferably under 40 years of age, must have served full apprenticeship in an engineering firm or equivalent organisation, with subsequent experience as an electrical engineering draughtsman. Acquaintance with I.E.E. wiring regulations (13th edition) and British Standard codes for electric wiring in buildings and workshop electrical installations required. Knowledge of indenting from working and layout drawings an advantage.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/50887/EF. 2880

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Civil)

Sub-Area Engineering Department of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class M, Grade 13 (£910 × £15 to £955 per annum). N.J.B. conditions of service.

Applicants should have experience in the construction of new works in reinforced concrete, steelwork and associated materials and the maintenance of industrial, office and show-room premises.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1150, not later than 25th January, 1960.

General Assistant Engineer

Weymouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 10 (£765 × £15 to £810 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcements to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications will be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1074, not later than 25th January, 1960.

Engineering Draughtsman (Civil)

Sub-Area Engineering Department of No. 2 (Newbury) Sub-Area. Salary N.J.B. Grade 6, Schedule D (£620 × £20 to £740 per annum). N.J.B. conditions of service.

Applicants should have had a good technical training and be experienced in the preparation of plans and detailed drawings of buildings and civil engineering works, including substations, service centres, workshops and offices.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1149, not later than 25th January, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 2955

CENTRAL ELECTRICITY
GENERATING BOARD

South Eastern Division

Third Assistant Engineer (Technical)
Divisional Headquarters, Kingston

APPLICATIONS must possess the Higher National Certificate in Electrical Engineering or equivalent qualifications and have some knowledge and experience of modern protective gear practice as applied in the Authority's power stations and on its transmission system. Ability to make calculations appropriate to the calibration and co-ordination of relay settings and to write a good report is most desirable.

N.B.J. conditions of service and salary Class AX/DX, Grade 6, £975-£1,190 p.a., including London allowance.

Applications giving details of education, experience, present position, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, to arrive by 22nd January, 1960. 2949

SUPERVISING ELECTRICAL
ENGINEER

required for the London head office of a well-known electrical contracting organisation to handle contracts throughout the U.K.

It is essential that applicants have extensive experience in this field, preferably with a contracting company.

This is a senior position and applications will not be considered from foremen and echargehands.

Commencing salary up to £1,750 p.a. according to experience.

Please write giving full details to—Box 2863.

Situations Vacant (continued)**SOUTH OF SCOTLAND
ELECTRICITY BOARD****Ayrshire Area**

APPPLICATIONS are invited for the following superannuable posts:—

- (1) **FOURTH ASSISTANT ENGINEER** (Meters, Test and Protection), AREA HEADQUARTERS, KILMARNOCK. Salary N.J.B. Schedule A, Class J, Grade 13, £765/£810 per annum.

Applicants should have had experience in the commissioning and routine testing of protective, substation and mains equipment up to 33 kV.

- (2) **GENERAL ASSISTANT DISTRICT ENGINEER, KILMARNOCK.**

- (3) **GENERAL ASSISTANT DISTRICT ENGINEER, AYR.**

Salary N.J.B. Schedule A, Class F, Grade 11, £710/£755 per annum.

Applicants should have had experience in overhead and underground systems up to 33 kV.

The minimum qualification for any of these posts is an Ordinary National Certificate in Electrical Engineering. The successful applicants will require to reside within a reasonable distance of their respective headquarters.

Application forms, which may be obtained from Mr. G. F. Moore, Manager, Greenholm Street, Kilmarnock, should be returned indicating the post applied for not later than 29th January, 1960. 2918

Applications are invited for the position of

**ASSISTANT
ELECTRICAL ENGINEER**

at a Steelworks in South Wales. Responsibility would be to the Chief Electrical Engineer.

Applicants should preferably be Graduates with some steelworks experience on hot mills, modern cold mills, process lines and distribution systems up to 11 kV.

The successful applicant would be required to join the company's pension scheme.

Particulars of qualifications and experience should be sent to the

Chief Engineer

MESSRS. RICHARD THOMAS

& BALDWIN LIMITED

Panteg Works, Griffithstown

Pontypool, Mon.

2908

**CENTRAL ELECTRICITY
GENERATING BOARD****South Wales Division**

Vacancy No. 2/ER/60

APPPLICATIONS are invited for superannuable N.J.B. appointment of **FOURTH ASSISTANT ENGINEER, MEASUREMENTS SECTION, TECHNICAL DEPARTMENT.**

Salary Grade AX/DX.8, £735 - £935 per annum.

H.N.C. or equivalent qualification desirable.

The work of this section involves precision measurements by means of potentiometer equipment, integrating meters, indicating instruments and electronic devices. Additional duties concern the acceptance testing of new generators, efficiency testing of existing plant, the initiation of signals for remote indication and much new development.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 25th January, 1960. 2922

BRITISH ENKA LIMITED

PRODUCERS OF MAN-MADE FIBRES

require

**ASSISTANT TO
CHIEF ELECTRICAL ENGINEER**

for modern well-equipped plant. Experience of installation, maintenance and operational work with continuous processes and of E.H.T. and M.V. systems necessary. Chemical experience an advantage. Ability to organise and handle labour essential. Minimum qualifications, Graduate I.E.E., preferably A.M.I.E.E.

Good salary and prospects. Pension scheme with facilities for transfer. Assistance with housing.

Applications, in confidence, should state age, qualifications, experience in sequence, and be addressed to Personnel Manager,

**BRITISH ENKA LIMITED
AINTREE, LIVERPOOL**

2933

**NORTH OF SCOTLAND
HYDRO-ELECTRIC BOARD****Dundee Area****Third Assistant Engineer (Construction)**

APPPLICATIONS are invited for the above-mentioned position. Applicants should have a good general experience in all types of substation construction work. Duties will include maintenance of 33-kV and 132-kV oil circuit breakers, on-load tap changing equipment and ancillary gear, also installation of multicore control cables, lighting and heating circuits in major substations and supervision of 33/11-kV substation construction.

The minimum educational qualification is the Higher National Certificate in Electrical Engineering, and preference will be given to applicants who are members of the Institution of Electrical Engineers or who have qualifications leading to membership.

Salary £910 to £955 per annum (N.J.B. Class H, Grade 9).

Application forms are obtainable from the Area Manager, 7, Dudhope Crescent Road, Dundee, and should be returned by the 25th January, 1960. 2917

**CENTRAL ELECTRICITY
GENERATING BOARD****Midlands Division**

ASSISTANT ENGINEER (Technical Records) is required at Hams Hall "B" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment, salary in accordance with Grade K.12, £860-£905 per annum.

Applicants should have received a sound technical training and practical experience in power station engineering and should be interested in statistical work. A recognised technical qualification will be an advantage.

Apply, quoting Vacancy No. 8/60MD, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 25th January, 1960. 2950

SALES ENGINEER

HADDON TRANSFORMERS Ltd. wish to engage a suitably qualified and experienced Engineer for negotiating the sale of Transformers and Saturable Reactors, 1-250 kVA, to industrial purchasers in the London and Home Counties areas.

Applications in confidence, giving full details of experience, to:—

**The Managing Director
HADDON TRANSFORMERS LTD.
Victoria Park Industrial Estate
Field End Road, Ruislip, Middlesex**

2805

**CENTRAL ELECTRICITY
GENERATING BOARD****South Eastern Division**

Vacancy No. 4/60

THIRD ASSISTANT ENGINEERS (Technical Department), based at Brighton and Northfleet.

Candidates must possess H.N.C. in Electrical Engineering or equivalent qualification and have some knowledge of system technology, including calculations dealing with balanced and unbalanced conditions.

Experience in the following aspects of technical department work is essential:—

1. Installation and maintenance of all types of automatic protective gear associated with the main transmission system and in power stations.
2. Commissioning tests on alternators, transformers and switchgear, including the preparation and co-ordination of testing programmes.
3. Fault investigation and preparation of reports.
4. Correspondence on electro-technical matters.

Salary within range £1,090 - £1,320, plus London allowance where applicable.

Applications giving age, details of experience, qualifications, etc., to Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames. Closing date 25th January, 1960. 2924

TECHNICAL WRITER**for Publicity Department**

to handle, in conjunction with Advertising Agents, literature for electrical and lighting products throughout all stages of production from planning to publication.

Applicants should have good technical writing background, preferably with experience in the lighting and electrical field.

Excellent conditions of employment in impressive new London building with optional membership of good staff pension scheme.

Applicants should include details of age, experience and salary required, to:—

Advertising Manager

ATLAS LIGHTING LIMITED

Thorn House, 2/4, Upper St. Martin's Lane, London, W.C.2

2936

ELECTRICAL ENGINEER

ASSISTANT required to the Electrical Engineer of The Copper Development Association to assist with technical matters relating to the use of copper and copper alloys in electrical engineering. Candidates should have professional qualifications of degree standard and some years' practical experience. Preferred age 25-34.

A generous non-contributory superannuation scheme is in force.

Details of training and experience should be marked "Confidential" and sent to the Secretary at 55, South Audley Street, London, W.1. 2961

GOVERNMENT OF KENYA**Engineer (Electrical), Ministry of Works**

to design electrical installations in public institutions, airports and housing.

Contract appointment with prospects of permanency. Salary range £1,194 - £1,863. Gratuity. Free passages. Quarters when available at low rent.

Candidates, 26-45 years, must be A.M.I.E.E. or possess a university degree in electrical engineering and have relevant experience.

Write Director of Recruitment, Colonial Office, London, S.W.1, giving full names, age, qualifications and experience, quoting reference BCD.112/7/027/D11. 2892

**CHIEF ENGINEER,
ELECTRICITY DEPARTMENT**

Grenada, Windward Islands

APPPLICATIONS are invited for the above pensionable appointment. Salary equivalent to £1,500 a year. Quarters will be provided at a rental of 10% of officer's salary. Free first class passages for officer, wife and three dependent children under 18 years. Liberal leave on full salary.

Candidates must possess a university degree or equivalent diploma in electrical engineering, or be Graduate or Corporate Members of the Institution of Electrical Engineers with appreciable electrical engineering experience. They must have held a responsible position for a minimum of three years with a well-established engineering concern providing wide experience in electrical engineering practice. The duties will include supervision of the plant of the power station, including icemaking plant and the Colony's electric light system, and the carrying out of any extension of electricity as may be decided on from time to time.

Applications should be addressed to the Secretary, Public Service Commission, Grenada, West Indies, and should reach him on or before 1st February, 1960. 2881

**SOUTH OF SCOTLAND
ELECTRICITY BOARD**

Lanarkshire Area

Fourth Assistant Engineer (Test)

APPPLICATIONS are invited for the above appointment. Applicants should possess the necessary technical qualifications and have had a sound engineering training. They should have had some experience in testing and commissioning modern protective equipment and should be conversant with voltage drop and short circuit calculations and H.V. fault location.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, the present Classification and Grading being L.13, salary £860/£905 per annum. The post is supernumerary.

The successful candidate will require to reside within a reasonable distance of the Transformer Test Department at Motherwell.

Application forms which may be obtained from the undersigned should be forwarded to this office within 14 days of the date of this advertisement.

R. J. RENNIE,

Montrose Crescent, Hamilton. 2957

SOUTH WALES ELECTRICITY BOARD

Assistant Engineer

APPPLICATIONS are invited for the position of ASSISTANT ENGINEER (Brecon) in the Mid Wales and North Mon District of the Monmouthshire and Mid Wales Area of the Board.

The salary for the position will be in accordance with Class E, Grade 7 (£860-£905) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.Sc., A.M.I.E.E., Manager, Monmouthshire and Mid Wales Area, Albany Chambers, Skinner Street, Newport, Mon, so as to reach him not later than the 27th January, 1960. 2878

**MERSEYSIDE AND NORTH WALES
ELECTRICITY BOARD**

DEMONSTRATOR required in the Liverpool South District. Salary will be within the range £525/£625 per annum (N.J.C. Grade 1) according to qualifications and experience.

Applicants should possess a recognised diploma in domestic science or other approved qualifications and should preferably have had training and experience in the demonstration and use of electric cookers and other domestic electrical appliances.

Pension scheme. Appointment subject to medical examination.

Applications stating age, previous experience, etc., should be forwarded to the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, not later than 25th January, 1960. 2952

**CITY AND COUNTY OF BRISTOL
EDUCATION COMMITTEE**

Bristol Technical College

Department of Engineering

THE above College is being formed by the separation, as from 1st September, 1960, of the present College of Technology into a College of Advanced Technology and a Regional College, the Bristol Technical College.

The Governors invite applications for the following new posts, to take effect from 1st May, 1960. Applicants should be graduates or equivalent with industrial, teaching and preferably some administrative experience. The Department will provide courses in Mechanical and Electrical Engineering up to Ordinary National Certificate level, together with all craft courses in Engineering.

The successful candidates will be directly responsible to the Head of Department for the appropriate section:—

1. SENIOR LECTURER IN MECHANICAL ENGINEERING.
2. SENIOR LECTURER IN ELECTRICAL ENGINEERING.

Burnham Technical Scale salary, £1,550 by £50 to £1,750 per annum.

Application forms, returnable as soon as possible, and details from Registrar, College of Technology, Ashley Down, Bristol, 7. 2932

**CENTRAL ELECTRICITY
GENERATING BOARD**South Wales Division
Vacancy No. 3/ER/60

APPPLICATIONS invited for superannuable N.J.B. position of THIRD ASSISTANT ENGINEER (Civil) in the TRANSMISSION (Construction) DEPARTMENT, DIVISIONAL HEADQUARTERS.

Salary AX/DX5 £(1,090-£1,320 per annum).

Applicants will be required to undertake duties concerned with the civil engineering and building construction by contract of new high voltage substations and extensions in the South Wales Division for the Central Electricity Generating Board. Experience of contract procedures, reinforced concrete work and site supervision particularly necessary.

Candidates should preferably be Corporate Members of the Institution of Civil Engineers or have qualifications leading thereto.

Special application forms obtainable from the Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 25th January, 1960. 2948

THE ELECTRICITY COUNCIL

Assistant to the Regional Safety Officer

THE Electricity Council require an ASSISTANT to the REGIONAL SAFETY OFFICER, Headquarters in Bristol. Candidates should have good engineering qualifications, a knowledge of the Factories Acts and Safety Regulations, and preferably some experience in accident prevention in the electricity supply industry.

Salary within N.J.B. Grade 4, £1,195-£1,545 p.a.

Applications stating age, salary and giving full details of qualifications and experience to E. Landucci, The Electricity Council, Winsley Street, London, W.1, to arrive not later than 30th January, 1960. Quote ref. ER/63. 2956

MIDDLE EAST

EXPANDING British company requires the services of an ELECTRICAL DESIGN ENGINEER with degree or similar qualifications. Preferably with experience of oil installations.

The post is permanent and offers considerable scope and interest. The successful applicant would be required to reside in Middle East countries for the two-year tour periods.

Reply giving details of personal background and past experience to—Box 2962.

**MERSEYSIDE AND NORTH WALES
ELECTRICITY BOARD**

(a) THIRD ASSISTANT ENGINEER

(Protection)

(b) FOURTH ASSISTANT ENGINEER

(Protection)

required in the Board's No. 2 Sub-Area Headquarters.

(a) Applicants should have had experience of testing and commissioning of H.V. electrical plant and its associated protective gear, an ability readily to interpret wiring diagrams, and a knowledge of calculations required to determine protective relay settings. They should be in possession of appropriate technical qualifications.

Salary within range £965/£1,025 per annum (N.J.B. K/10).

(b) The duties will include testing and commissioning switchgear, transformers and associated equipment up to 33 kV. Applicants should possess appropriate technical qualifications.

Salary within range £815/£860 per annum (N.J.B. K/13).

Appointments subject to medical examination. Pension scheme.

Application forms, obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire, should be returned not later than 25th January, 1960. 2954

**CENTRAL ELECTRICITY
GENERATING BOARD**

North Eastern and Yorkshire Region

Third Assistant Engineer,
Technical Department

APPPLICATIONS are invited for an appointment as THIRD ASSISTANT ENGINEER in the System Design Section, based on Divisional Headquarters, Leeds.

Applicants should possess technical qualifications leading to Corporate Membership of the I.E.E., and be experienced in calculations relating to high-voltage generation and transmission systems and to reinforcements thereof.

The salary for the appointment will be in accordance with the National Joint Board Agreement (£925-£1,170 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 25th January, 1960. 2915

SOUTH WALES ELECTRICITY BOARD

Assistant Engineer

APPPLICATIONS are invited for the position of ASSISTANT ENGINEER in the Swansea and West Central Area of the Board.

The salary for the position will be in accordance with Class L, Grade 10 (£1,025/£1,085 per annum) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.Sc., M.I.E.E., M.Am.I.E.E., Manager, Swansea and West Central Area, 29, Ystrad Road, Swansea Industrial Estate, Swansea, Glam, so as to reach him not later than the 27th January, 1960. 2879

MINISTRY OF AVIATION

ELECTRICAL ENGINEERS (Assistant Signals Officers) required for aviation telecommunications and electronic navigational aids. Minimum age 23, 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E. or A.F.R.Ae.S. (candidates with Parts I, II and III of A.M.I.E.E. or Parts I and II of A.F.R.Ae.S. or equivalent or of very high professional attainment without these qualifications considered).

Salary £690 (age 23) to £1,125 (age 34), maximum £1,300. Slightly lower outside London and for women. Promotion prospects.

Further details and forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.554/9A. 261

Situations Vacant (continued)

DRAUGHTSMEN

seeking scope for their initiative and ability will find interesting work at Fosters.

The company's diverse range of products includes transformers of all types, voltage regulators and control equipment, with new products being developed continuously.

Apply giving details of past experience, age and salary required to Personnel Officer, Foster Transformers Ltd., South Wimbledon, London, S.W.19.

2893

**CENTRAL ELECTRICITY
GENERATING BOARD****Midlands Division**

OPERATION SUPERINTENDENT is required at Hams Hall "A" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.5, £1,360-£1,450.

Applicants should have received a sound technical and practical training, and should have considerable experience in the operation and maintenance problems arising in a large modern power station. The possession of a recognised technical qualification will be an advantage.

Apply, quoting Vacancy No. 3/60MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 25th January, 1960.

2905

**CENTRAL ELECTRICITY
GENERATING BOARD****Midlands Division**

GENERAL ASSISTANT ENGINEER required at Worcester Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.12, £610-£655 per annum.

Applicants should have received a sound technical training, and should preferably hold the Higher National Certificate in mechanical or electrical engineering. Duties will be of a general technical nature, including the preparation of the power station statistics.

Apply, quoting Vacancy No. 1/60MD, on form AE6, available from the Establishments Officer, Central Electricity Generating Board, 53, Wake Green Road, Moseley, Birmingham, 13, by 25th January, 1960.

2904

**THE METALLIC SEAMLESS
TUBE CO. LTD.**

JUNIOR SALES REPRESENTATIVE required in London. The position is permanent and offers attractive future prospects. Knowledge of the electrical wholesale industry essential.

All applications, which will be treated in the strictest confidence, should give age and full details of previous experience, and should be addressed to the Manager, The Metallic Seamless Tube Co. Ltd., 88, Goswell Road, London, E.C.1.

2894

**SOUTH-EAST ESSEX TECHNICAL
COLLEGE AND SCHOOL OF ART**
Longbridge Road, Dagenham

REQUIRED as soon as possible:—**LECTURER** in Electrical Engineering to lecture to H.N.C. level in electrical subjects and in Advanced Electrical Engineering and Electrical Machines or Electricity Supply for the I.E.E. Part III Examination. Candidates should have a degree in electrical engineering or be Corporate Members of the Institution of Electrical Engineers, and have had teaching as well as industrial experience.

Salary (men) within range £1,408 to £1,601 p.a. depending on training, qualifications and previous experience.

Details and forms (stamped, addressed foolscap envelope) from the Clerk to the Governors.

2946

A SENIOR electrical draughtsman required to participate in the planning and installation of a new plant involving H.V. and L.V. switchgear, A.C. and D.C. motors, control gear and electronic equipment. Accommodation available. Applications stating age, qualifications, training and subsequent experience to the Labour Manager, Barrow Steel Works Limited, P.O. Box No. 16, Walney Road, Barrow-in-Furness, Lancashire. 2910

A GENT-representative required for the London area by specialist manufacturer for purpose-made control panels.—Box 2963.

A electro-mechanical draughtsman required by engineering company. Must be capable of detailed design and systematic handling of various projects. 5-day week, canteen, pension fund. Apply in writing stating age, previous experience, qualifications, if any, to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 2964

A engineering insurance company requires an engineer for appointment as inspecting engineer of electrical plant. Candidates must possess H.N.C. in Electrical Engineering or equivalent and have served an apprenticeship with a manufacturer of electrical machinery. Apply in own handwriting to the National Boiler and General Insurance Co. Ltd., St. Mary's Parsonage, Manchester, 3, giving age (limits 26 to 33), training and experience, academic qualifications and copies of testimonials. Salary £800-£1,100 (progressive). Non-contributory pension scheme. 2841

Accounts assist. reqd. by electrical contractors, permanent, good prospects. Salary up to £800 according to experience. Write age, exp., sal. reqd.—Sec., Alliance Electrical, 2, Henrietta Street, London, W.C.2. 2883

Applications are invited from ambitious and resourceful men to fill the position of technical assistant to the sales manager of electric lamp machinery manufacturers near London. A permanent, progressive and interesting job is offered to the right person, who must possess a sound engineering and commercial background in the trade. Applications with full particulars of education, experience and salary required to—Box 328.

Assistant to manager of plant producing sintered permanent magnets required by Murex Limited, Rainham, Essex. Applicants, in the age group 25-28 years, should have a thorough knowledge of electrical and magnetic practice, preferably with experience in instrument design. Some knowledge of metallurgy would be advantageous. Salary according to qualifications and experience. Superannuation scheme, etc. 5-day week. Applications giving full particulars to Staff Department. 2884

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. Ltd., Longridge House, Manchester, 4. Electrical surveyors required in England and Scotland. Permanent positions carrying progressive salary scale £800 to £1,100 with non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 2937

BRITISH LUMA require a foreman for their fluorescent tube department. Excellent opportunity for intelligent man in developing field. Experience of fluorescent production essential. Write stating age and experience to Manager, British Luma, Hardgate Road, Glasgow, S.W.1. 2842

Circuit draughtsman. Young man, age 22/35, required for circuitry work associated with automatic control gear. O.N.C. standard preferred. Permanent and progressive position. Pension fund, canteen. Apply in writing giving full details of age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 2966

Circuit engineer required for development work. Previous experience of control gear desirable. Minimum academic qualifications H.N.C. Permanent and pensionable position. Please write giving full details of age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 2965

Control gear engineer required, age 23/35, for layout and circuiting of contactor equipment. Experience of lift equipment would be an advantage. Permanent and progressive position. Good salary. Canteen, pension fund. Write stating age, experience and qualifications, if any, to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 2967

Designer-draughtsman for electric lighting fittings. London area. Good prospects. 5-day week. Apply stating age, experience and salary required to—Box 2885.

Electrical contractors' draughtsman with some experience of estimating required by Kuwait Associates. Salary £1,000-£1,200 per annum. Free furnished accommodation. Cost-of-living allowance £37 10s. per month. Single man preferred as no married accommodation available for first two years. Contract on yearly basis with option of renewal. Paid leave at rate of 36 days per annum on total overseas service if tour extended to second year. Applications, stating age and experience, to—Drake & Gorham (Contractors) Limited, 36, Grosvenor Gardens, London, S.W.1. 2886

Electrical department of large group of companies requires draughtsmen for interesting work on new projects. Applicants should have experience in distribution, control and utilisation of electric power, and should be of Ordinary National standard at least. The posts offer scope for advancement within the group. Five-day week. Pension scheme. Canteen and social club facilities. Apply, giving details of age, experience and salary required to Personnel Manager, T.I. (Group Services) Limited, Rocky Lane, Aston, Birmingham, 6. 2809

Electrical engineer required by London consulting engineers for preparation of design, specifications, etc., for schools, hospitals and commercial buildings, etc. Write stating age, experience, qualifications and salary required to—Box 160.

Electrical engineer required for head office staff. Degree or graduate membership of I.E.E. and practical training at manufacturer of electrical machines. Upper age limit 35. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., Longridge House, Manchester, 4. 2938

Electrical engineer required for London consulting engineers' office. Applicants should be Associate Members of the I.E.E. and experienced in the complete design of electrical services in hospitals, universities, colleges, etc.—Box 2773.

Electrical tester. The type of man we require should have previous experience of testing control gear, be capable of working with the minimum of supervision, and have a clear understanding of the principles of electric motors. 5-day week, canteen, pension fund. Apply in writing stating age, previous experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 2968

Electrician/electrical mechanic, first class, experienced installation work, required by large electrical concern; 12 months' service overseas. Excellent opportunity. Write experience, age, references.—Box 2828.

Energetic sales engineer required for Midlands area to develop sales of a wide range of M.V. switchgear preparatory to establishing a depot. Connections desirable with consultants, leading contractors, electricity board and industrial users for cubicles, metalclad switchboards, complete range of fuse and switchgear, substation boards, feeder pillars, busbar trunking. Please give full experience, present salary, etc., in confidence to Managing Director, G. P. Dennis Ltd., Speke, Liverpool. 2927

Engineer with electrical and mechanical background and some sales and administrative training to act as assistant to the managing director of London contractors with view to directorship. Please state age and experience.—Box 189.

Estimating engineer for electrical contracting work with a wide experience of large industrial and commercial installations. Applications to be in writing, giving full details of training, qualifications, experience and salary expected.—W. J. Furse & Co. (Manchester) Ltd., 20, Mount Street, Manchester, 2. 2969

Expanding British company in Iran requires a qualified telecommunications engineer for design office in Teheran. Experience in the planning of telephone exchange networks and cable distribution schemes together with experience in VHF/UHF single and multi-channel radio systems is essential. A knowledge of flameproof and intrinsically safe equipment should be an advantage. Minimum age 30. Salary according to age and experience with general local allowances. Two-year contracts. Full particulars to—Box 2895.

ESTIMATOR required for electrical contracting department of progressive West London firm. Must be fully conversant with all types of installations for business and industrial premises and should have previously held similar post. Please submit details of training and experience to—Box 2913.

EVERSHED & VIGNOLES Ltd., require young engineers of O.N.C. Electrical Engineering standard for their instrument division contracts department. Expanding opportunities for advancement. Write—Personnel Manager (Ref. 115), Cunnington Street, London, W.4. 2970

EXCELLENT prospects for contract engineers and supervisors experienced in electrical cable work, overhead line transmission and installations, Midlands and Southern England. The aim of the company is expansion with obvious promotion opportunities. Apply giving full particulars. Early interviews arranged.—Box 325.

EXPANDING British company in Iran requires a qualified instrumentation engineer for design office in Teheran. Must be experienced in industrial process automatic control, preferably as applied to the oil or chemical industries, boiler and turbine control and alarm systems. Electronics experience would be an advantage. Minimum age 28. Salary according to age and experience with general local allowances. Two-year contracts. Full particulars to—Box 2896.

EXPERIENCED staff foreman required for London electrical contractor, capable of supervising various types of contracts. Ability to drive and experience of estimating an advantage, but not essential. Please reply to—Box 2887.

GREENGATE & IRWELL RUBBER Co. Ltd., Manchester, have a vacancy for a technical assistant to the cable works manager. H.N. Certificate and practical experience in electrical cable design would be required. Apply in writing, in confidence, to the Personnel Department, Greengate & Irwell Rubber Co. Ltd., Greengate Works, Manchester, 3. 2897

GREENGATE & IRWELL RUBBER Co. Ltd. require two experienced cable salesmen for (a) West Midlands, Leicestershire, Northamptonshire, and (b) East Cheshire, Potteries and East Midlands. Applicants should write in confidence giving full details of past experience to Cable Sales Manager, Greengate Works, Manchester, 3. 2898

JUNIOR sales engineer to operate from Manchester sales office of control gear manufacturers. Promotion to full outside status later. State fully experience, present salary and salary expected to—Box 2834.

MALE invoice clerk required by electrical wholesale company S.E. London. Knowledge of electrical industry essential. 5-day week. Write stating age, experience, salary required.—Box 2971.

MANAGER required by electrical contractor in Birmingham, engaged on school, hospital and industrial installations. Must have sound estimating, technical and administrative ability and capable of handling contracts from enquiry to final accounts. Application in confidence with fullest details of experience, positions held and approximate salary received.—Box 9899.

PIRELLI-GENERAL CABLE WORKS Ltd. require transmission engineers to carry out overhead line contracts in England and Wales. Apply in writing stating age, experience and salary required to the Manager, Overhead Lines Department, Eastleigh, Hants. 2926

PLUMBER joiners, H.V. and L.V., required for contracting work. Applicants should be willing to undertake a trade test.—Box 2868.

REPRESENTATIVE required on salary and commission basis by London electrical and mechanical engineers. Previous experience not essential, providing ability to sell. Please state age and experience.—Box 190.

SALES. A vacancy exists in the sales department of a well-known firm of electric motor manufacturers. Theoretical and practical training essential. Good prospects for advancement. Age 21 to 30. Apply in confidence stating age, experience and salary required.—Box 2831.

SALES clerks (semi-senior) for customer liaison duties. Experience of cables and flexibles an advantage. Permanent progressive post. Details positions held, present salary to Reliance Cords & Cables Ltd., Staffa Road, Leyton, London, E.10. 9900

SALES engineer required by control gear manufacturers. Age 28/35 years. Required to operate in Yorkshire area. Salary, expenses, pension scheme and car provided. Write fully giving age, details of past history, salaries earned and expected to—Box 2830.

SALES engineer required for London area by electrical equipment manufacturers. Should have good technical knowledge of motor control gear and associated equipment. Interviews will be arranged in London during January. Please reply giving full details to—Box 2844.

SALES engineer to operate from London office of leading manufacturers of electric motors and generators. Pension scheme. Bonus and opportunities of promotion for young man with the right personality and qualifications. Write in confidence giving full details of age, education, training, experience and salary required to—Box 2888.

SALES engineer to promote and develop the sale of industrial sockets and plugs and switchgear in Greater London. Salary, expenses, car allowance, pension scheme. Full details of qualifications and experience in confidence to Mr. F. French, Edmundsons Electrical Wholesalers Ltd., 240-250, Ferndale Road, London, S.W.9. 2899

SALES engineers with established connections in the London, Birmingham and Leeds area to represent a well-established company manufacturing motors and electric control gear. Apply in confidence with full details to—Box 2928.

SENIOR electrical draughtsmen (design) required for Northern Ireland, having experience particularly in the ranges of induction motors 1 to 200 h.p. and 200 to 2,000 h.p. Additional experience in alternators an advantage. Good salaries. Progressive positions. Pension scheme. Reply giving full particulars of age, qualifications and experience to—Box 2974.

SENIOR transformer designer, with a wide experience covering units used in the electronic and industrial field up to 500 kVA. Preferably with drawing office experience. Directorship would be offered after probationary period. Apply—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 2870

SUPERVISING engineer, fully experienced and qualified, required by electrical contractors specialising in heavy industrial and commercial installations. Exceptional prospects.—Electrobuilt Ltd., 117, Uxbridge Road, London, W.12 (Tel. SHE. 1760). 9905

SUPERVISING engineer, fully experienced for London installation contractors. This is a senior post and applicants must have held similar grade for number of years. Excellent prospects, good salary and pension scheme. When applying state age and give full details of past experience.—Box 9902.

SUPERVISOR. A progressive position is offered by a well-established firm of contractors operating from London to a man with experience and a keen sense of responsibility. Please forward full details to—Box 2900.

SUPERVISOR or foreman required for electrical contracting business. Fully experienced in handling medium-sized contracts. Some knowledge of pricing an advantage. Write giving full details of experience and salary required to—Hamilton Cole (Sussex) Ltd., 201, Heene Road, Worthing, Sussex (Telephone, Worthing 1961/1887). 2872

SWITCHGEAR engineer. Technically qualified man required with wide experience of preparation of tenders for all classes of switchgear up to 11 kV. Applications to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Writtle Road, Chelmsford. 2973

TECHNICAL assistant required in electrical and mechanical engineering section, chief engineer's dept., with experience of modern electrical and mechanical installations in large buildings. Experience of heating and ventilating an advantage. Graduate or associate membership of recognised professional body preferred. Up to £895 according to qualifications and experience. Pension scheme. Staff restaurant. One Saturday worked in five. Application form from Chief Engineer (60/6), L.C.C., County Hall, London, S.E.1. (2921) 2934

TECHNICAL representative (25 to 40) required to call on architects, consultants and contractors in Lancs and Cheshire. Knowledge of power distribution systems essential. Design experience an advantage. Please state salary required, age, qualifications and experience to—Box 2816.

TECHNICAL representative required, London area, for the floor warming department of a well-known cable company. Applicants should have a sound knowledge of electric floor warming practice and preference will be given to those who have qualifications in heating or electrical engineering. Good connections amongst architects and consulting engineers will be a useful asset. Reply in confidence, giving age, full details of qualifications, experience and salaries earned to the Personnel Officer—Box 2972.

TRADE counter assistant / storekeeper urgently needed, Ilford area. Experience wholesale trade essential. Write giving full details to—Box 2982.

TWO assistant electrical engineers required by large firm architects Central London; H.N.C. or O.N.C. standard only. Apply giving personal details, education, experience, salary required.—Box 2817.

WE require electrical draughtsmen who are conversant with electric motor control panel equipment. Applicants should be capable of preparing wiring diagrams from schematic diagrams. Interesting position for persons who wish to widen their experience to include electronic control systems. Pleasant working conditions, superannuation scheme. Written applications to W. H. Smith & Co. Elec. Engrs. Ltd., Shepley Industrial Estate, Audenshaw, Manchester. 2975

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

CHARTERED electrical engineer (38) with export sales experience seeks position as commercial executive with switchgear/motor/transformer/electronics manufacturer in Surrey area. Prepared to invest some capital.—Box 9888

ELECTRICAL fitter (35), O.N.C., apprenticed, prepared to travel for progressive post. Write—Harris, 708, Christchurch Road, Bournemouth. 9892

ELECTRICIAN (29), apprentice trained, requires progressive position.—Box 9889.

FOREMAN, aged 40, seeks further overseas contract, experienced most types installations, H.V./L.V. overhead/underground, installation and maintenance contractors' plant.—Box 9903.

MANUFACTURERS' representative, contacts wholesalers, retailers, users, London area, desires change.—Box 9895.

REPRESENTATIVE, progressive, organising ability, technical experience domestic and industrial, car, office, phone, requires post electrical representative or agent Midlands.—Box 9897.

SALES manager, A.M.I.E.E., public school (42), works trained, seeks change. Top contacts industry and boards in South, handling switch and control gear, also motors, electronics, installation work. About £1,750.—Box 9882.

SUPERVISING elec. engr. (32) exp. contracting, maintnce., estimat'g; car owner.—Box 9901

ARTICLES FOR SALE

VARIABLE SPEED MOTORS FOR 400/440/3/50 SUPPLY

No.	H.P.	R.P.M.	Make.	Price (each).
8	2.48/0.13	2000/100	SIEMENS	£55 (b)
1	2.5/0.13	2000/100	E.E.C.	£55 (b)
3	2.95/0.13	2000/100	SIEMENS	£60 (b)
13	3.0/1.8	2200/137	B.T.H.	£60 (b)
4	7.5/0.32	2500/125	ASEA	£105 (a)

Little used and in excellent condition.

(a) Remote Control. (b) Manual Control.

FYFE, WILSON & CO. LTD.

Station Works, Bishop's Stortford, Herts (Bishops Stortford 1000)

2977

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

Articles for Sale (continued)

600**OIL-COOLED TRANSFORMERS**

kVA	Primary	Secondary	Maker	Remarks
600	6600	400/3/50	B.E.T.	Delta/Star
440	6350	400/3/50	G.E.C.	" "
400	3300	440/3/50	G.E.C.	" "
300	6500	465/3/50	HACKBRIDGE	" "
300	3300	450/3/50	B.T.H.	" "
200	400	200	YORKSHIRE ELECT.	Star/Auto
200	11000	433	THERMO CONTROL	Delta/Star
150	10750	440/3/50	FOSTER	" "
150	6600	420/3/50	YORKSHIRE	" "
100	11000	415/3/50	S. WALES SWITCHGEAR	" "
50	3300	400/3/50	HACKBRIDGE	" Several available
32	400	200/400/3/50	BRENTFORD	Variable voltage
30	3300	400/3/50	HACKBRIDGE	Delta/Star
10	3300	400/3/50	MET.-VICK.	" "
10	400/1/50	20/40	B.E.T.	Air cooled variable voltage
6	400/1/50	10/20	B.E.T.	" " " "

Selection only from our comprehensive stock.
All covered by our guarantee.

GEORGE COHEN

Sons & Co. Ltd.

Wood Lane, London, W.12
(Shepherds Bush 2070)Stanningley, Nr. Leeds
(Pudsey 2241)

2779



**FOR SALE: B.T.H. 950-kVA
ROPE-DRIVEN ALTERNATOR**

Type AGT.137, Serial No. R214806, 16-pole, 400/3/50, 1,370 amps., 8 p.f. lagging, 10.4-kW exciter, 97 volts, 107 amps., 375 r.p.m., 40-groove rope pulley and fabricated steel bedplate, complete with B.T.H. steel-cased control panel with main breaker and volt and amp meters.

NEW MAY, 1955.

Apply:

EDWARD RUSHTON SON & KENYON
12, York Street, Manchester, 2
(Tel. CENTRAL 1937/9)

2901

EQUIPMENT FOR SALE

DIESEL ENGINE, 5 R.W., 5-cyl. PAXMAN RICARDO, 110 b.h.p., 1,100 r.p.m., with elec. starting and batteries. Extension shaft and outer bearing, cooling pump, oil cooler and thermometer.

9-kVA ALTERNATOR, 230 v., with pulley exciter and slide rails.

HEWITT MERCURY ARC RECTIFIER, input 400 v. A.C., single-phase, output 410 v. D.C., 122 amps., complete with transformer.

W. R. ROYLE & SON LTD.

207-229, Essex Road, London, N.1

Tel. CANonbury 3377

2911

A. J. PRATT & SONS LTD.
THE CHAIN SPECIALISTS

CHAINS in Brass, Steel, Aluminium and Gilding Metal.

Coil, Jack, Ladder, Oval, Trace, Curb, Chandelier, Ball, Victor fancy chains and ALL types of chain assemblies in EVERY finish.

Hooks, Rings, Wireforms, Presswork.

Head Office: Chain House, Woodbridge Street, London, E.C.1

CLerkenwell 3742 (2 lines) 2738

HOUSE SERVICE METERS

200 -240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.

221, City Road, London, E.C.1 37

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeyput Lane, Stanmore, Middx. (Edgware 5566/9). 91

600**VARIABLE SPEED DRIVES, 415 3/50 INPUT**

H.P.	Speed.	Maker.	Remarks.
0.525	0/1000	G.E.C.	Ward Leonard
0.340/340	0/1200/1600	E.E.C.	" "
0.275/275	0/1500/1800	E.E.C.	" "
67.5/270	95/370	B.T.H.	Schrage Motor
0.200/200	0/750/960	G.E.C.	Ward Leonard
0.150/150	0/1000/1700	BRUSH	" "
0.130	0/1000	L.S.E.	" "
35/70	650/1300	B.T.H.	Remote C. Schrage
0.160	0/1500	ALLEN	Ward Leonard
0.150/50	0/2000/2900	E.E.C.	" "
0.45	0/2700	L.S.E.	" "
20/40	500/1000	B.T.H.	Schrage
0.133/33	0/1200/1500	MAWDSLEY	Ward Leonard
0.20/26	0/2000/2500	E.E.C.	" "
4.5/21	400/1450	FULLER	Schrage

Prompt despatch all covered by guarantee.

GEORGE COHEN

Sons & Co. Ltd.

Wood Lane, London, W.12
(Shepherds Bush 2070)Stanningley, Nr. Leeds
(Pudsey 2241)

2751

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY87/89, Sterte Avenue, Poole, Dorset
(Tel.: Poole 272)371, West Green Road, Tottenham, London,
N.15 (Tel.: Bowes Park 7080) 191

ABACOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLerkenwell 5512). 24

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

AUTO-synchronous motors, 2 available, 50 h.p., 1,000 r.p.m., by Crompton Parkinson, 400 v., 3-phase, 50 cycles, with starters. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 79

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (ISLeworth 4534/5). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL and motor generating sets, A.C. and D.C., up to 750 kW.—E. M. Tatton, Kew Bridge, Brentford (ISLeworth 4534/5). 116

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FOR quality fluorescent fittings, trunking systems, tubes and control gear contact Anglo-American Electrical Company, Olive St., Bury (Phone, Bolton 7251). 213

600**STANDARD A.C. MOTORS, 415/3/50, PROTECTED FRAME, BALL/ROLLER BEARINGS**

H.P.	Speed	Make	Remarks
125	2900	CLARKE CHAPMAN	Squirrel Cage
120	720	BROOK	Slipring
100	485	BROOK	Slipring
90	725	MET.-VICK.	Slipring
60	970	E.E.C.	Slipring
50	725	E.E.C.	Slipring
40	960	HOLMES	Slipring
40	1440	C.P.	Squirrel Cage
35	1460	BROOK	Slipring
35	960	BROOK	Slipring

Starting Gear available.
Prompt Delivery, covered by Guarantee.

GEORGE COHEN

Sons & Co. Ltd.
Wood Lane, London, W.12
(Shepherds Bush 2070)
Stanningley, Nr. Leeds
(Pudsey 2241)

2780

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—Anglo-American Electrical Company, Olive St., Bury (Phone, Bolton 7251). 212

FOR sale, good, unused and used machinery, including electric motors, A.C. and D.C., dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

GEARED motors, 35 h.p., 730/45 r.p.m., B.T.H. slipring, T.E.F.C., 400 v., 3-phase, 50 cycles, with fully automatic Brookhirst panels and power plant reduction gear. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 80

GENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

KARDEX, Roneodex and Shannovue cabinets, as new.—F. H. Jolly & Co. Ltd., 289, King St., London, W.6 (RIV. 5381). 202

MERCURY rectifier, input 400/3/50, output 50 kW, 110 volts D.C. Complete with control gear. Little used and in excellent condition.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 2978

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS and control gear, huge stocks all types, ½ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

NUMBER of self-contained arc welding sets consisting of Meadows petrol engine, generators, switchboards, etc., suitable for electrodes sizes 6-14. Excellent condition. Price £165 each.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 2976

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY credit meters, single and polyphase, 2½-100 amps. From 20/-. Also D.C. See Television.—Tradex, Surbiton. 171

RECONDITIONED motors. Large stocks of motors and starters always on offer. Write for list and prices to Southern & Redfern Ltd., Woodhead Road, Bradford, 7 (Bradford 23871). 296

ROTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screw & Repetition Co. Ltd., Woodgate, Leicester. 180

TE.F.C. motors, 150 h.p., 420/625 r.p.m., 440 v. D.C., modern Laurence Scott, 2 available. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 81

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

VENNER time switches, 200-240 v., A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

WARD Leonard set for 400 v., 3-phase, 50-cycle supply, with work motor 0/120 h.p., 0/700 r.p.m., with starter and control gear. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 76

2-speed motor, 40/20 h.p., 950/480 r.p.m., T.E.F.C. slipring type by L.D.C. with Igranic automatic control panel. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 78

180-h.p., 970-r.p.m. T.E.F.C. slipring motor by Lancashire, 400 v., 3-phase, 50 cycles, complete with fully automatic starting panel. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 77

300-kW, 225/240-volt D.C. generator, compound interpole, 375 r.p.m., built by L.D.C. for engine coupling, complete with single pedestal bearing, half coupling and sole plates. Switchboard available. Good serviceable condition. Inspection at Wembley.—Dynamo & Motor Repairs Ltd., Wembley Park Works, North End Road, Wembley. 83

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

200-kW motor generator by E.C.C., output 220 v. D.C., compound, input 300 h.p., 440 v., 3-phase, 50 cycles, complete with starter and D.C. control gear. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 74

500-kW, 220-volt Met.-Vick. rotary converter, with transformer, 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 17

500/625-kW Lancashire D.C. generator 240 volts, 2,080/2,600 amps., 1,000 r.p.m., compound interpole, screen protected, originally coupled to a geared turbine, but adaptable for direct coupling to an A.C. motor, complete with switchboard with circuit breaker, regulator, ammeter, etc. Also spare armature. Inspection at Wembley. Further details on request to—Dynamo & Motor Repairs Ltd., Wembley Park Works, North End Road, Wembley. 84

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

ARTICLES WANTED**SURPLUS**

D.C./A.C. Motors, Transformers, Cables and all redundant Power Station Plant wanted for dismantling.

ASK US TO QUOTE

BARKING METAL TRADING CO. LTD.
London Road, Barking
(RIP. 3387/3715)

298

A.C./D.C. electric motors, generators, transformers, disused stocks of cable, power houses bought and dismantled.—John Hyams & Sons, 127, Lambs Lane, Rainham, Essex. 5024/4896. 9896

A.C. generating set required, 3-phase, 30-60 kVA. Details and lowest price.—Derby Chicks Hatchery, Gerard Street, Derby. 9876

D.C. generators wanted, 1,500 amps. or larger, to a total of 10,000 amps., 55/60 volts, with or without A.C. motors. Details to—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park. 85

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963). 114

"OVERHEAD-Line Charts," by J. S. Forrest. Copies of this booklet, published by *Electrical Review*, are required by the publishers. Full retail published price will be paid. 9767

QUICKSILVER and beryllium copper scrap urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

WANTED, alternator, 100/125 kVA, 400/440/3/50, 500 r.p.m., preferably with exciter and control panel. Single-bearing machine might suit.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 2979

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

75-kW steam engine-driven alternator set, 400/3/50, suitable 100 lb. p.s.i., 10 lb. back pressure.—Box 2935.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honey-pot Lane, Stanmore, Middx. 92

MANUFACTURING company wishes to co-operate with electrical engineers who have erectors operating over the whole country and could install their product mainly against Government contracts. Considerable business available which exceeds the capacity of the company's own erection staff.—Box 2981.

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications. Write—Dept. 'S', Philpott's Metal Works Ltd., Chapman Street, Loughborough. 211

AGENCIES**IMPORTS FROM U.S.A.**

OLD-established large New York firm of shippers, confirmers, purchasing and financing agents offers its services to British importers of American goods. Kindly reply to—Box 2980.

AGENCIES required for United Kingdom by well-established manufacturers' agents for Continental electrical accessories and small domestic appliances. Substantial references; ample finance available.—Box 119.

TECH. representative with first-class connection desires agency for control equipment, instruments, relays, etc. Stores, workshop and fully qualified technical staff available. Yorks area.—Box 9898.

BUSINESSES FOR SALE AND WANTED

CONTRACTORS' business for sale in busy London business area. Suit 2 live experienced electricians to reorganise and extend goodwill—HOLborn 8622. 2775

ELECTRICAL motor repair business for disposal, established 10 years. Complete with all equipment, motor van and comprehensive stock of wire and electric motors: £2,000 with goodwill and lease. Principals only. C.A. figures.—Box 2889.

PARTNERSHIPS

PARTNERSHIP in elect. contracting required by qualified engr. (London area).—Box 9904

BUSINESS OPPORTUNITIES

GOVERNING director of old-established London electrical engineers and contractors, turnover £50,000 to £100,000, desiring to "ease up" over next two years, invites enquiries for acquisition of business, with guarantee of continuity for, say, two years.—Box 318.

PATENT NOTICES

THE proprietor of Patent No. 738395 for "Improvements in or relating to finger type circuit regulators" desires to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2. 2912

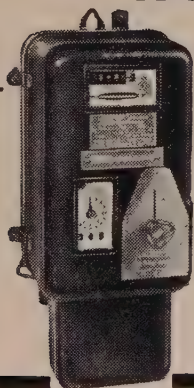
EDUCATIONAL

CITY and Guilds (Electrical, etc.) on "No pass—No fee" terms. Over 95% successes. For details of modern courses in all branches of electrical engineering, applied electronics, automation, etc., send for our 148-page handbook—free and post free.—B.I.E.T. (Dept. 12a), 29, Wright's Lane, London, W.8. 100

ADVERTISEMENT BLOCKS

Will advertisers on whose behalf we still hold blocks last used between
**4th January, 1957 and
27th December, 1957**
please advise us by the 29th January, 1960 if they wish them to be returned

Unwanted blocks will be destroyed

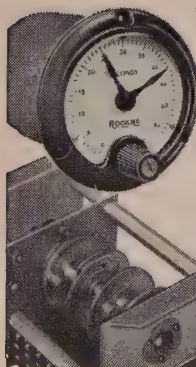
HOUSE SERVICE METERS

Credit Pattern
and Prepayment Type
200-240 v. A.C. S/Ph 50 c. (& D.C.)
AVAILABLE FROM STOCK
POLYPHASE 400-440 v. 3-wire Type
Ex Stock

UNIVERSAL ELECTRICAL CO.
217-221 City Road, London, E.C.1

TIMERS by the RODENE

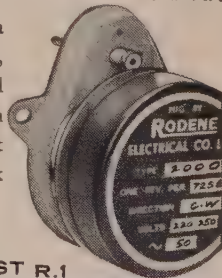
Electrical Co. Ltd.



Rodene manufacture a wide range of Timers, including the specialised motors used, from simple single circuit units to complex sequence controllers.

Made in England

WRITE FOR LIST R.1



Sole Distributors
D. ROBINSON and COMPANY
717 LONDON ROAD, HOUNSLOW, MIDDLESEX.
Tel. HOUnslow 6266-6267 & 8338

LAPLACE TRANSFORMS FOR ELECTRICAL ENGINEERS

By B. J. Starkey, DIPL. ING., A.M.I.E.E.

A presentation of the theory of Laplace transformation in which a physical vocabulary rather than a purely mathematical one is used as far as possible. This method of analysis has become of increasing importance to electrical engineers in many fields, and the work is designed to provide a thorough treatment of the subject in a language with which they will be familiar. Published for "Wireless Engineer."

30s. net. BY POST 31s. 1/2d.

From booksellers or direct from *Hiffe & Sons Limited*, Dorset House, Stamford Street, London, S.E.1

JOHN DOCKER & Co. (ENGINEERS) Ltd.
MANUFACTURERS OF

CABLE MAKING MACHINERY

BUNCHING & TWINNING M/CS.
24" & 18" DIA. BOBBINS

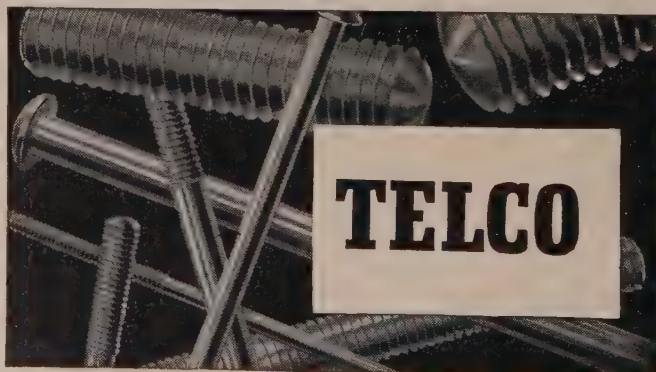
STRANDING & LAYING-UP M/CS.

PAY-OFF & TAKE UP STANDS
16" TO 8' 0" DIA. DRUMS

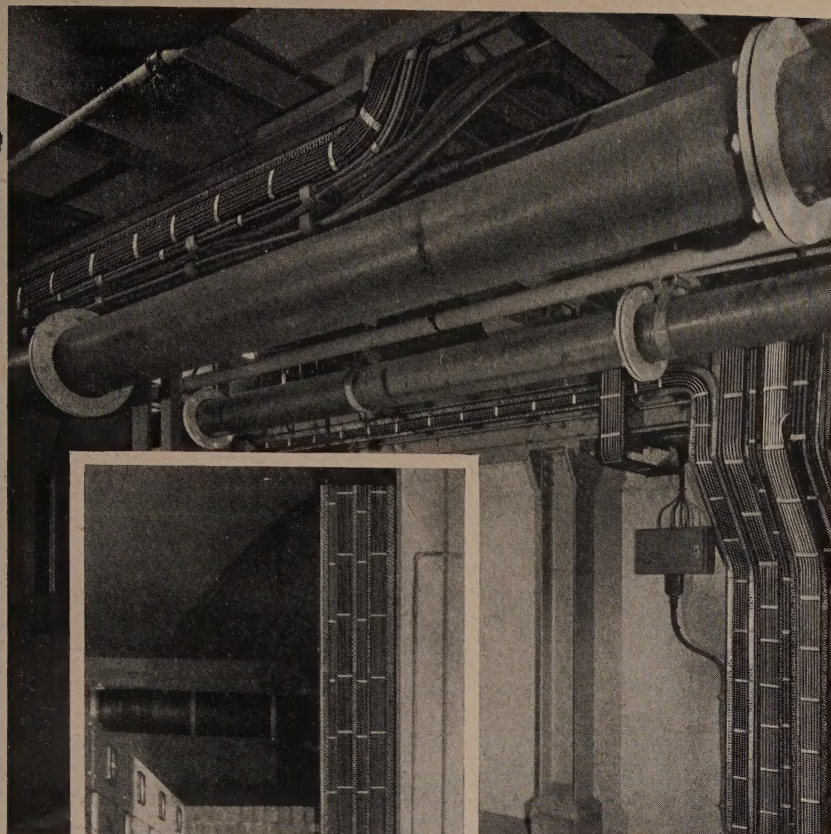
SPIRAL MARKING MACHINES
FOR PLASTIC COVERED CABLES

EXTRUDING SCREWS

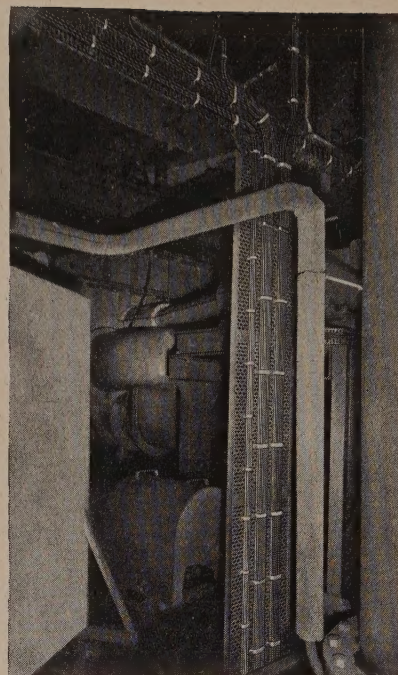
CROMWELL WORKS
NORTH FELTHAM TRADING ESTATE
FELTHAM, MIDDLESEX. TEL.: FELTHAM 6341/3



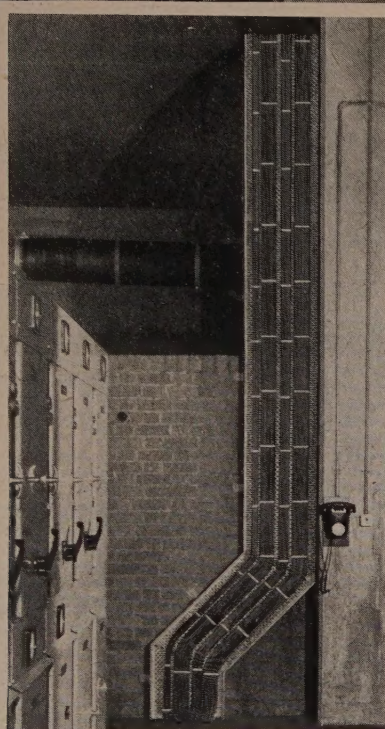
Studding - Studs - Allthreads - Tie Rods
TELCO LTD., 3 Newman Street, London, W.1
MUSEum ST01/4



No. 6 Machine Room. Pyrotenax control wiring for Super Calendar.



Nos. 5 and 6 Machine Rooms head-box rolls motor control circuits.



Long bank runs of power and control cables feeding grinder conveyors and situated in 3.3 k.v. sub-station.

Pyrotenax

at BOWATERS

The long bank runs and neat short loops of "Pyrotenax" at the Power Station, Paper Machine and Grinder House, of Bowater's Mersey Division at Ellesmere Park, Cheshire are a joy to any electrician's eye. We are proud (but not surprised!) that "Pyrotenax" was chosen for this extremely important industrial installation; some of the wiring has to withstand heat and wet and dirt—conditions that "Pyrotenax" has found perfectly tolerable for years. Main Electrical Contractors: Messrs. TANJON (N/C) LTD.



Pyrotenax motor control circuits on boiler front in Power House.



The use of the trade name "Pyrotenax" is exclusive to the products of this company and its associates.

there is no substitute for experience

PYROTENAX LIMITED HEBBURN-ON-TYNE • Tel: Hebburn 83-2244/8

LONDON: Victoria 3745 • BIRMINGHAM: Midland 1265 • MANCHESTER: Deansgate 3346/7 • LEEDS: Leeds 27826 • GLASGOW: City 3641/2 • CARDIFF: Cardiff 23689
GD129

A.E.I. Lamp & Lighting Co. Ltd.	72	East London Mica Works	30	London Electric Wire Co. & Smiths Ltd.	3	Rothschild, N. M., & Sons	33
Aircraft - Marine Products (Gt. Britain) Ltd.	37	Elcordia Ltd.	105	Low Moor Alloy Steelworks Ltd.	43	Rotunda Ltd.	106
Appelbe, J. F., & Co. Ltd.	90	Electrical Remote Control Co. Ltd.	34	Lyons, Claude, Ltd.	61	Rowlands Electrical Accessories Ltd.	89
Asquith Electrics (Colne) Ltd.	33	Electro Dynamic Construction Co. Ltd.	79	M.K. Electric Ltd.	62	Sheen (Nottingham) Ltd.	22
Associated Electrical Industries Ltd. 5, 11, 20, 35, 38, 39, 72 & 110	110	Electrolux Ltd.	24 & 25	Macfarlane Engineering Co. Ltd.	99	Shell-Mex & R.P. Ltd.	14 & 15
Associated Fire Alarms Ltd.	60	Ellay Tubes Ltd.	69	Macintyre, James, & Co. Ltd.	22	Simmonds Bros.	34
Avo Ltd.	41	Ellison, Geo., Ltd.	31	Manganese Bronze & Brass Co. Ltd.	45	Simmonds & Stokes (Niphan) Ltd.	100
Belmos Co. Ltd.	51	Enalon Plastics Ltd.	27	Mek-Elek Engineering Ltd.	96	Simplex Electric Co. Ltd.	74
Biroh, H. A., & Co. Ltd.	28	English Electric Co. Ltd.	67	Mercury Switch Mfg. Co. Ltd.	34	Sims, F. D., Ltd.	76
Birmingham Mica Co. Ltd.	90	Equipment & Services Ltd.	76	Meritus (Barnet) Ltd.	108	Souplex Ltd.	28
Birmingham Specialities Ltd.	36	Evershed & Vignoles Ltd.	23	Metway Electrical Industries Ltd.	61 & 105	Stockfield Mfg. Co. Ltd.	33
Bleeco Ltd.	108	Falk, Stadelmann & Co. Ltd.	112	Micafl Ltd.	32	Sturdy Electric Co. Ltd.	94
Braby, F. & Co. Ltd.	71	Fawcett Preston & Co. Ltd.	92	Midland Dynamo Co. Ltd.	98	Sturtevant Eng. Co. Ltd.	7
Bray, E. N., Ltd.	94	Ferranti Ltd.	42	Midland Electric Mfg. Co. Ltd.	66	Sutcliffe Speakman & Co. Ltd.	90
Brentford Transformers Ltd.	77	Ferraris, Fred (Clerkenwell) Ltd.	108	Mole, M., & Son Ltd.	28	Symonds, R. H., Ltd.	48
Bridge, David, & Co. Ltd.	98	FitzGibbon & Murray Ltd.	94	Mycalex & T.I.M. Ltd.	34	Tanjon (N/O) Ltd.	75
British Insulated Callender's Cables Ltd.	Cover 2	Furse, W. J., & Co. Ltd.	76	Norwood Steel Equipment Ltd.	64	Technirep	100
British Klockner Switchgear Ltd.	16	General Electric Co. Ltd.	Cover 4, 68, 84, 85, 102, 103 & 114	Oddie, Bradbury & Cull Ltd.	78	Telco Ltd.	126
British Micanizing Co. (Great Barr) Ltd.	128	Gramplan Reproducers Ltd.	100	Oliver Pell Control Ltd.	21	Telegraph Construction & Maintenance Co. Ltd.	Cover 1
Brook Motors Ltd.	29	Greenwood Airvac Conduits Ltd.	81	Otter Controls Ltd.	82	Tetra Eng. Co. Ltd.	50
Brush Electrical Eng. Co. Ltd.	6	Guest Keen & Nettlefolds (Midlands) Ltd.	12	Parmiter Hope & Sugden Ltd.	113	Thomas (Richard) & Baldwins Ltd.	Cover 3
Bryce Electric Construction Co. Ltd.	87	Hall & Pickles Ltd.	17	Parsonage, W. F., & Co. Ltd.	36	Transformer & Electrical Co. Ltd.	108
Bullers Ltd.	73	Hampton Works (Stampings) Ltd.	27	Paxtons (Electrical) Ltd.	44	Turner Bros. Asbestos Co. Ltd.	111
Cable Supports Ltd.	78	Harvey, G. A., & Co. (London) Ltd.	52	Phillips Electrical Ltd.	13	Universal Electrical Co.	126
Carr, James W., & Co. Ltd.	90	Heaven, Dowsett & Co. Ltd.	16	Phillips Control (G.B.) Ltd.	28	Varilectric Ltd.	69
Carter, H. W., & James Ltd.	94	Henley Burrows & Co. Ltd.	76	Pinchin Johnson & Co.	46	Vernier Mfg. Co. Ltd.	50
Central Electricity Generating Board	80	Higgs Motors Ltd.	1	Plessey Co. Ltd.	60 & 86	Victor Products (Wallsend) Ltd.	93
Channel Conduits Ltd.	64	High Duty Alloys Ltd.	104	Portable Furnace & Patents Co.	27	Volex Electrical Products Ltd.	97
City Electrical Co.	128	Hughes, J. W.	128	Pyrotex Ltd.	127	Weekes, L. (Luton) Ltd.	106
Cohen, George, Sons & Co. Ltd.	88	Imperial Chemical Industries Ltd.	10	Radiation Ltd. 53, 54, 55, 56, 57, 58 & 59	95	Wootton & Co. Ltd.	21
Connollys (Blackley) Ltd.	18 & 83	Insuloid Mfg. Co. Ltd.	36	Radiospares Ltd.	9	Worthington-Simpson Ltd.	49
Craig & Derricott Ltd.	83	Irish Cables Ltd.	101	Rawplugh Co. Ltd.	107	Zenith Electric Co. Ltd.	44
Crompton Parkinson Ltd.	2, 26 & 109	Ismay Lamps Ltd.	27	Record Electrical Co. Ltd.	8 & 47		
Cryselco Ltd.	91	Jeary Electrical Co. Ltd.	96	Reyrolle, A., & Co. Ltd.	126		
Daly (Condensers) Ltd.	93	Jelson Electric Ltd.	78	Robinson, D., & Co.			
Davies, W. W. B.	16	Johnson & Phillips Ltd.	65				
"Diamond H" Switches Ltd.	70	Key Engineering Co. Ltd.	4				
Docker, John, & Co. (Engineers) Ltd.	126	Ley's Malleable Castings Co. Ltd.	89				
Donovan Electrical Co. Ltd.	128	Lindsay & Williams Ltd.	82				
Downes & Davies Ltd.	30	Litholite Insulators & St. Albans Mouldings Ltd.	36				
Drummond, John (Engineers) Ltd.	100						
Dubilier Condenser Co. (1925) Ltd.	70						
Du Pont Co. (United Kingdom) Ltd.	40						

NO WAITING

J. W. HUGHES
for
IMMEDIATE
DELIVERY OF

TIME SWITCHES

VENNER

HORSTMANN

SANGAMO

SMITHS

Stock Lists and
Discounts on request

J. W. HUGHES, 3 St. Thomas Street, London Bridge, London, S.E.1

Phone: HOP 2759

BRITISH MICANIZING
= CO. (Great Barr) LTD. =BAKELITE
FABRICATORS

IN

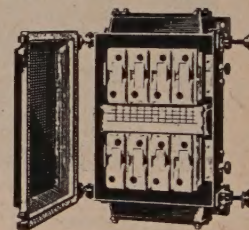
SHEETS • TUBES • RODS

MACHINED PARTS

ELECTRICAL INSULATION MANUFACTURERS

Newton Road, Great Barr, Birmingham, 22a

Phone: GREAt Barr 1021

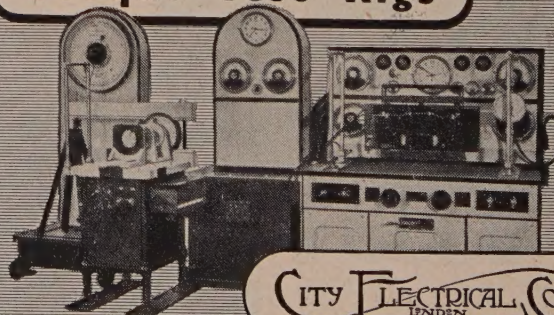
CONTACT
DONOVAN
FOR ALL ELECTRICAL
WHOLESALE SUPPLIESAll makes of
Iron-Clad
FUSE-BOARDS

Contractors and Retailers should contact DONOVAN for prompt service

THE DONOVAN ELECTRICAL CO. LTD. (WHOLESALE DIVISION)

75-82 GRANVILLE STREET, BIRMINGHAM 1 Phone: MIDland 5683

Torque Test Rigs

CITY ELECTRICAL CO
LONDON

EMERALD STREET, LONDON, W.C.1. HOLBORN 9722

One of many three-phase, 50 cycle,
120,000 kVA, 275/132 kV
Auto-transformers supplied by the
BTH Company for the British Super Grid.

LAMINATIONS

of all types, in all sizes
and in all grades of materials.

FERROSIL hot-rolled
and cold-reduced electrical
sheet and strip, and
hot-rolled transformer sheet.

ALPHASIL
cold-reduced oriented
transformer sheet and strip.

RICHARD THOMAS & BALDWINS LIMITED

Lamination Works: COOKLEY WORKS, BRIERLEY HILL, STAFFS.
Midland Section Office: WILDEN, STOURPORT-ON-SEVERN, WORCS.
Head Office: 47, PARK STREET, LONDON, W.1.

*Our Cookley Works is one of the largest in Europe
specializing in the manufacture of laminations for the electrical industry.*

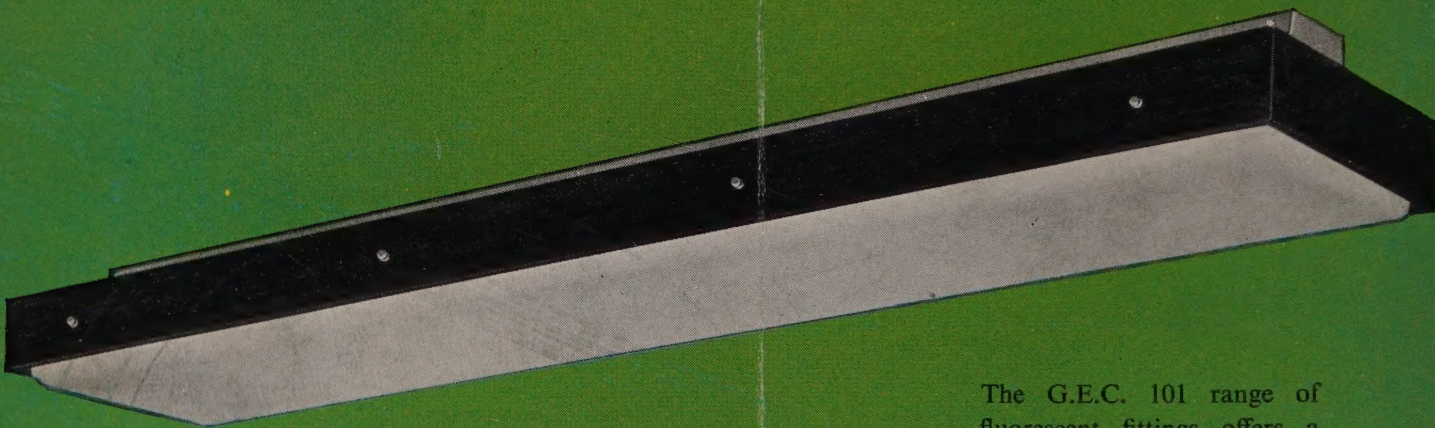
THE CORE OF A FINE TRANSFORMER
LAMINATIONS BY



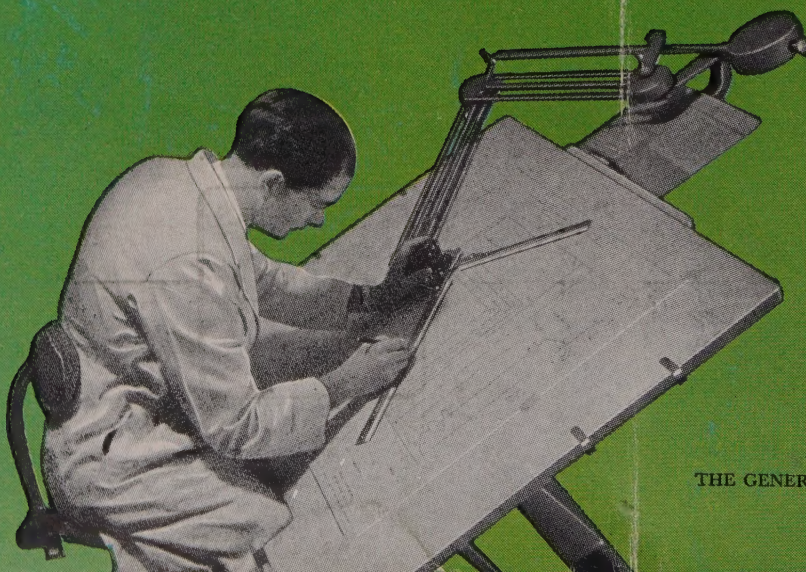
*for every lighting requirement in
executive offices, shops, stores and factories*

101
range

fluorescent lighting fittings



The G.E.C. 101 range of fluorescent fittings offers a wide choice of designs for every lighting requirement. Employing the G.E.C. basic channel with its advantages of versatility and economy in installation and maintenance, they are used with 1½ to 8 ft. single or twin Osram guaranteed tubes.



G.E.C.
LIGHTING DIVISION